Annex 4. Session Summary

Session Summary of FNCA JFY2011 Workshop on Mutation Breeding Project

Session 1 Country Report

Nine Member Countries presented their country reports. The brief summaries are as follows:

Bangladesh (Dr. A.N.K. Mamun, BAEC)

One long fine grain-aromatic rice was developed which derived from cross breeding is applied for registration and hopefully it will release as a new variety soon. Finally selected two mutant lines derived from Ashfal by using Carbon ion beam with good agronomic traits is expected to apply for some formalities to release a new variety. After evaluation and field trial on the basis of their performance, 10 lines were selected for Boro season and other 10 lines were selected for Aman season which derived from carbone ion beam mutated progeny of BRRI Dhan29 and these also needed for further selection. Evaluation and screening of M_2 bulk populations derived from carbon ion beams irradiated local Aus cv.Mousar is going on..

Indonesia (Dr. Sobrizal, BATAN)

It was observed that yield of some mutant lines were significantly higher than that of national leading variety Ciherang. Among ten tested lines three lines have red endosperm color and the other lines have white endosperm color. The amylase content of these lines were varied ranging from 13.41 to 20.83 % (low to intermediate). These variations of lines are very useful to fulfill the demand of wide preference variability of Indonesian rice consumers. Multi-location yield trials will be continued in next growing season to reach at least 16 locations as a requirement of variety release in Indonesia.

Japan (D.r Minoru Nishimura, IRB)

We completed raising amylose library with amylose-content gradients of about 2% in Koshihikari. We also obtained NILs consisted of 22 $F_{4\text{-}5}$ lines backcrossed with Hitomebore and newly selected mutants to be added to this library induced by ion beam and gamma-ray irradiation. In 2012, we will try the evaluation of the response of amylose content of NILs to the temperature during grain-filling period.

Korea (Dr. Si-Yong Kang, KAERI)

In 2011, a new rice varieties developed by radiation breeding, "GoldAmi-1" with high amino acid content was officially released from the KAERI after official registration. In recent, new lines with high tocopherol content has been selected and it will be released after official registration. And in order to identify gene function using a number of rice mutant populations, TILLING (Targeting Induced Local Lesions IN Genomes) projects were promoted in rice. KAERI's researchers are currently trying to establish new mutation breeding technologies, such as space and ion-beam breeding, in collaboration with Chinese, Russian and Japanese research teams. With financial

support from the government, a new "Radiation Breeding Research Center" is under construction by 2013 in ARTI of the KAERI, and it will play a key role in research and extension of mutation breeding technology in future.

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

Two advance mutant lines, namely MR219-4 and MR219-9 will be verified under stress condition at non-granary area. Thirty one mutant lines derived from mutagenesis of MR219 with 60 Gy ion beam were selected. Amylose content and biochemical study for low GI index of these mutant lines will be determined. One advance mutant line namely MR264 will be crossed with isogenic line from IRRI for blast disease improvement.

Mongolia (Dr. Bekh-Ochir Jamyan Bayan, Institute of Veterinary Medicine of Mongolia)

Wheat is most important crop for human consumption in Mongolia. Therefore, main method of increasing wheat production is developed new varieties with high yield and good quality. The short growing seasons, low precipitation are everriding contains of Mongolian agriculture. The Mongolian research orientation of wheat targeted on improvement of high grain production. High grain quality and tolerance drought and hot trough the contribution of mutation breeding technique.

The Philippines (Ms. Adelaida C. Barrida, PNRI)

1. Some putative mutant lines with desirable agronomic traits were selected in plants irradiated with 200 Gy and 300 Gy gamma rays. Likewise, lines with low to intermediate amylose content were also selected in the irradiated plants using the iodine staining method or the qualitative method of analysis. The control and the check variety belong to intermediate to high amylose.
2. In terms of protein content, the irradiated plants did not differ with the control and the check variety.
3. In the heavy ion beam irradiation, some plants with desirable agronomic traits were selected in the M_2 and M_3 generations of irradiated plants; such as early flowering, high tillering, short plants and high number of grains per panicle.

Thailand (Dr. Suniyom Taprab, DOR)

When photoperiodism and dosages of gamma ray were considered, it was found that 20 Kr (200 Gy) and 30 Kr (300 Gy) induced different frequency of mutation on amylose content. Photoperiod sensitive mutants of RD15, KDML105 and KTH17 mostly contained lower amylose than wild types did. But 20 Kr created wider variation of amylose content. In contrast, photoperiod insensitive mutants showed different distribution from photoperiod sensitive mutants. From RD15, lower dose of 20 Kr induced higher amylose content than higher dose of 30 Kr. It produced very higher amylose content up to 28% mutants compared to its 15% amylose wild type. The dose of 30 Kr induced lower amylose to the lowest of 10% amylose content.

Vietnam (Dr. Le Huy Ham, AGI)

By using carbon ion beam irradiation treatment to Khangdan variety at the dose of 40 Gy and 60 Gy, in M_5 generation two promising mutant lines were selected. Two promising lines were namely

DT40 and DT41 which are better perormance than the control and lodging resistant. High dose of carbon ion beam causes sterily in M_1 generation up to 40%. Irradiation treatment gamma ray was performed to Bacthom varieties at the dose of 100, 150 and 200 Gy. The range variations were observed in M_2 generation: short and long grow duration; brown and white hush, big and small seed and so on. From M5 population of Bacthom mutant in the formula 200 Gy, one promising was selected namely DT39. Main characteristics of DT39 were good quality (light aroma), high yield and good resistant to Bacterial Blight. The performance component, agronomical character of DT39 and amylose content will be tested in 2012.

Session 3 Following up of Previous Sub-Projects

Malaysia, the Philippines reported on two sub-projects on Disease Resistance in Banana and Insect Resistance in Orchid. The brief summaries are as follows:

1. Sub-Project on Disease Resistance in Banana

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

Technology Transfer Agreement has been formulated between Nuclear Malaysia and an Industrial Partner, Selamat Indah Sdn. Bhd. The transfer of technology includes 1) Protocols and procedures for tissue culture techniques for the production of in vitro plantlets, 2) Bioreactor technology for mass propagation, 3) Process of hardening or acclimatization of in vitro plantlets for field planting and 4) Process of artificial inoculation for screening and selection against Fusarium wilt disease. A new proposal had been agreed for collaboration with Selamat Indah Sdn Bhd for the commercialization of another potential local variety of banana, Pisang Tanduk, using bioreactor technology. Another technology transfer has been agreed between Nuclear Malaysia and Kelantan Biotech Company for the use of molecular markers for varietal identification and characterization.

The Philippines (Ms. Adelaida C. Barrida, PNRI)

Molecular characterization of mutant lines

- Conducted molecular characterization of mutant lines using SSR analysis.
  1) Screened 36 SSR primers
  2) 17 primers (47.2%) produced polymorphic bands in some mutant lines but with no amplification products in 1 or 2 mutant lines
- Eleven (11) SSR markers were able to discriminate most of the mutant lines studied; likewise the somaclonal variant 6-30-2 was discriminated with several primers.

Mass propagation and dissemination of BBTV-resistant mutant lines

- Generation of 4 suckers from selected resistant mutant lines were collected indexed micropropagated.
- To date, ~3,000 plantlets (100-300 shoot cultures/line) from selected mutant lines are maintained in vitro for future utilization and dissemination.
- Other mutant lines (not selected for BBTV resistance are likewise maintained in vitro for further evaluation for other traits

2. Sub-Project on Insect Resistance in Orchid

Malaysia (Dr. Sobri Bin Hussein, Nuclear Malaysia)

The project has generated 3 potential orchid mutant lines which are tolerant to insects (i.e 2

mutant lines Dendrobium jayakarta tolerant to thrips and 1 mutant D. mirbellianum tolerant to mites). At present, Nuclear Malaysia has signed MOA with a local commercial orchid company (Hexagon Green Sdn Bhd) for a project on "Pre-commercialization of orchid mutants for cut flower industry". Through this collaboration, Hexagon Green will carry out pre-commercialization studies which include field performance and market survey on Nuclear Malaysia's orchid mutants including the potential insect mutant lines.