FNCA Mutation Breeding Project

Five Years Plan of Sub-Project on improvement of Composition or Quality in rice

Country	FY2007	FY2008	FY2009	FY2010	FY2011
Bangladesh		1) Collection of salt tolerant rice landraces from coastal regions. 2) Determination of protein and amylose content in the collected landraces. 3) Irradiation of seeds by different doses (250-400 Gy) of gamma ray. 4) Raising of M_1 generation in the experimental field. 5) Development of embryogenic calli from mature seeds. 6) stablishment of regeneration system from embryogenic calli.	1) Collection of seeds from M1 plants and raising of M_2 population in the experi- mental field for screening and selection. 2) Irradiation of embryogenic calli with different doses (20-60 Gy) of gamma rays. 3) Maintenance and scree- ning of calli onto MS/N6 medium added with 0.5-1.5% NaCl for 120 days with periodical subculturing. 4) Regeneration of M_1V_1 plants from surviving calli on NaCl-free medium.	1) Raising and evaluation of putative mutants in M3 generation in the saline soil of coastal region for high protein, high amylose and high yield. 2) Raising and selection of M_1V_1 plants in NaCl-free soil to get M_2V_2 seeds. 3) Screening and selection of M_2V_2 plants for high protein, amylose and yield in pot culture treated with 0.5-1.5% NaCl under greenhouse condition.	1) Raising and evaluation of mutants in M4 generation in the saline soil of coastal region. 2) Raising of M_3V_3 in the fields of saline affected coastal areas for selection. 3) Evaluation of selected plants in the succeeding generations for protein content, amylose content, yield and salinity tolerance.
Indonesia	Construction of breeding materials (M2)	Purification of breeding materials (M3, M4)	1) Multiplication of seeds of pure lines (M5 lines) 2) Screening the lines for amylase contents	1) Screening the lines for amylase contents (Cont.) 2) Breeding for high yielding and grain qualities of rice varieties using selected lines	1) Breeding for high yielding and grain qualities of rice varieties using selected lines (Cont.) 2) Writing final repoert
Korea	**Color rice**				
	1) Collection of breeding materials from foreign and native rice germplasm 2) Irradiation of radiation (acute/chronic, gamma, ion beam) 3) Harvesting M2 seeds	1) Culturing M3 plants and selection of useful mutants 2) Analysis of functional compounds: Anthocyanin, Chrisanthemin (C3G; cyanidin 3-glucoside), tocoperol, etc.	M4-5 generation field trial, analyses of functional compounds and related molecular markers, and selection	Selection of promising lines	Local adaptability trials and registration
	Amylose library				
	1) Ilpumbyeo: irradiation of gamma ray with 250 dose 2) Harvested M2 seed	Culturing M2 plants and selection of amylose mutants after analysis of amylose content and seed morphology	1) Culturing M3 mutant generation and reselection after analysis and characterization 2) Molecular analysis using amylose mutants	Characterization and line selection	1) Construction of mutant library with various amylose contents 2) Selection of promising mutant lines for new variety
Japan	1) Research method : Use existing amylose variants 2)Research Object : Raise Koshihikari NILs relating to amylose 3)Expected achievements : Broadened amylose variants	1) Research method : Use mutagens such as gamma-rays and ion beams 2) Research Object : Screen amylose variants from primary varieties 3) Expected achievements : Creation of amylose library	1) Research method : Use mutagens such as gamma-rays and ion beams 2) Research Object : Screen amylose variants from primary varieties 3) Expected achievements : Creation of amylose library	1) Research method : Use mutagens such as gamma-rays and ion beams 2) Research Object : Screen amylose variants from primary varieties 3) Expected achievements : Creation of amylose library	1) Research method : Evaluate amylose library under various cultivation conditions 2) Research Object : Evaluate amylose library 3) Expected achievements : Completion of amylose library
Malaysia	Irradiation of seeds of advanced lines of MR 211, MR219, and MR 256, Q74 with gamma rays	Line screening of selected mutant lines from M3-M4 Laboratory analysis of amylose content and total	Mutant confirmation in lab (PCR-based) and field condition Evaluating the promising mutants for high yield and	Yield trails of advanced mutant lines Advance Yield Trial of promising mutant line Quality	Adaptability study of selected mutant line in several location of grainy area Local

	(re-irradiation) and ion beams Field screening of M1-M2 populations	starch content. Molecular screening with specific microsatelitemarker	quality traits (M5-M6) To screen potential mutant lines of MR 211, MR219, and MR 256, Q74 with low amylase and total starch content. Starch profiling using molecular techniques.	evaluation of advanced mutant lines for Milling quality, physical quality, chemical and sensory	varification Test/Regional trial at Farmer plot Release
The Philippines	1) Irradiation of seeds 2) Determination of radiosensitivity to gamma radiation 3) Growing of M_1 generation	1) Identification of mutants in the M_2 generation 2) Determination of amylose and protein content and other grain quality attributes	1) Selection of mutants with improved grain quality in the M_3 and later generations 2) Determination of amylose and protein content of selected mutants	1) Multiplication of desirable mutants 2) Determination of amylose and protein content of selected mutants	Submission of desirable mutants with improved grain quality to the National Seed Industry Council for registration
Thailand	**Low Phytate in Rice**				
	1) Genetics studies of Low phytic acid mutants derived from M6 of irradiated variety SPR1), RD23, 2) Generation of Mapping population for Low Phytate (LP) traits. 3) Analysis of genes involved in phytic acid biosynthesis of the generated population.	1) Yield, Fe content and other agronomic traits evaluation of derived LP mutant lines. 2) LP molecular marker developing. 3) Developing simplified protocol of breeding screening technique for high Fe content. 4) Generate new mutant populations (using LP mutants as parents) for high Fe content.	1) Continue yield, Fe content and other agronomic traits evaluation of derived LP mutant lines. 2) Screening for Low Phytate mutants combined with good grain quality (eg. Low amylase, aroma) from newly generated population using MAS.	1) Study on G x E and stability in term of Fe content in advance LP mutant lines performed good agronomic characters and acceptable grain yield. 2) Analysis of Fe content and cooking quality of elite LP mutants. 3) LP mutants with good grain quality to be selected for other agronomic traits by conventional pedigree selection.	1) LP mutant derived from SPR1 cultivar with high Fe bioavailability and acceptable cooking quality will be recommended. 2) LP mutants with good grain quality to be continue selected in further breeding program.
	Low Amylose and Low Protein in Rice				
	1) Compositional analysis of Glu A and Glu B in rice genetic stock (Thai local varieties) using conventional screening techniques (SDS-PAGE). 2) Chemical analysis for amylose content of the individuals with low glutelin. 3) Data compilation for amylose content and protein library.	1) Induce mutation in the varieties KDML105 (low amylose) and CNT1 (high amylose) sing gamma ray irradiation. 2) Mutants screening for storage protein)low glutelin) and low amylose content using conventional technique. 3) Identification of glutelin by SDS-PAGE with Coomassie Blue staining and PCR in low glutelin mutants.	1) Development of Glu A-I and Glu B-1 antibodies through recombinant protein expression system as described by Tanaka (2004) 2) Develop simple screening technique using glutelin antibodies for large-scale screening and breeding effort. 3) Low glutelin and low amylose mutants (M2 plants) will be selected.	M3 mutants with low glutelin and low amylose will be selected for desire agronomic traits by pedigree selection mean. Low glutelin and low amylase still be maintained using screening technique previously developed.	1) M4 mutants with low glutelin and amylase will be further selected for desire agronomic traits. 2) M5 seeds will be derived and analysed for other desire grain qualities eg. aroma, cooking quality and will be tested for disease and insect resistance.
Viet Nam	1) Promising pure mutant lines at M8-M10 (2-5) obtained from aromatic rice cultivars in Vietnam such as Tam Aromatic and Basmati 370, namely BDS1 and TL4, TDS3, Red ST3,... have been released for breeding program (long grain rice (>7.5 mm in length) with high yield (>5.5 t/ha/crop). 2) Quality certificate has been done for 3 lines mentioned above to confirm their promising grain quality to meet the export demands. 3) Molecular Examinations of Mutant Lines have been carried out in Molecular Lab. supported by IAEA/TC VIE 5/015 (in Center for Nuclear Techniques, HoChiMinh City).	1) Promising Crossing lines (3-5) at M3-4F5-6 purified and released at large scales in Soctrang province in Mekong Delta 2) Regional acceptance > 500 ha (2-4 lines of rice with high yield, quality, long grain), and National Nominations.	1) Promising Crossing lines at large scales would be released for field trials and National Promotion for 2-3 pure mutant lines (>1000 ha) 2) Quality Examinations of Mutant Lines tested under National Program	1) Development of new 2-3 varieties (mutant and/or combined with crossing) for export quality: Amylose content 16-22% Protein content 9-11%	National Promotion for upland 2-3 pure mutant lines with high yield and quality for highland regions in Vietnam (>1000 ha) 2) National Promotion for 3-5 new varieties of rice for Export Rice Program of million ha, and Development of molecular markers for genes for rice quality (aroma and length of grain,...)