vars which have the potential to replace both the traditional and evolved basmati types that are currently being grown. As the international trade recognizes only the traditional basmati cultivars as true basmati, (as has been done by the European Union by waiving the entry duty to six traditional basmati cultivars), the mutant in the background of basmati 370 can also be considered as a traditional basmati and may find favour with the international market. The mutant also fits into the cropping system pattern of the basmati zone as its duration is similar to that of Pusa Basmati 1 and T. Basmati.

The other mutants generated under the program had the requisite yield potential, but could not be classified as basmati due to deficiency of in one/more quality characters that are preset for basmati. This implies that attention should be given to quality characteristics even using mutation techniques for rice improvement

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Genetic Improvement of Brown – Planthopper (*Nilaparvata lugens*) Resistance through Radiation Technique in Rice

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The debate over genetic manipulation and its use in plant improvement for insect resistance has led to an increased demand for developing various alternative methods. Mutation induction for plant genetic improvement is one of the oldest but still relevant, economic and recognized methods. Mutations induced by radiation can alter the host parasite interaction by alteration relevant gene sequence, and thus enhance resistance to insect pests while keeping intact the original plant type [1].

Brown-planthopper (*Nilaparvata lugens*) is a major insect pest of rice in the region of Chhattisgarh State. Use of insecticide to control this insect is loosing its ground due to development of resurgence, insecticide resistance in insects and insecticide residue in crop plant at crop maturity stage. Varieties viz. Safri, Mahsuri, Dubraj and Mahamaya are most popular in this region, but are susceptible to this insect pest. Therefore, these four varieties were taken into consideration for genetic improvement through radiation techniques.

Seeds of these varieties were exposed to four doses of gamma rays viz. 150, 200, 250, & 300 Gy at Bhabha Atomic Research Center (BARC) Mumbai (M.S.) India. M_1 generations were raised in the field during 2003-2004 kharif in the experimental plot of Entomology Department, IGAU Raipur. The M_2 seeds of randomly harvested from 100 M_1 plants were tested using BPH larvae, which are throughout the year at temperature $\pm$ 28-30°C in glass house, as per the standard technique [2]. Survived seedlings from wooden screening boxes were repotted in earthen pots individually. M_3 seeds were harvested from these survived individual plants for further test.

A total of 3000 seedlings from 100 M_1 plants of each variety/treatment were evaluated in M_2 generation and 2 to 57 tentative resistant M_2 seedlings were identified for the three varieties (Table 1). In M_3, 510,150 and 60 seedlings were grown from the seeds harvested from the resistant M_2 plants and screened for their resistance to BPH. Finally, 49, 21 and 17 seedlings were found resistant to

BPH in Safri -17, Mahsuri and Dubraj varieties, respectively (Table 1).

Except for variety Mahamaya, we identified resistant seedlings from progenies derived from plants treated with gamma rays. The segregation of resistant/susceptible seedlings in M_3 might indicate that the genetic control of BPH resistance is complicated in these lines, and the selected lines should be further tested in M_4 and advanced generations.

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Table 1. Brown planthopper Rice Resistant Mutants

Variety	Treatments (Gy)	Generations					
		M_2 (2003-04)			M_3(2004-05)		
		Total seedlings tested	Reaction		Total seedlings tested	Reaction	
			R	S		R	S
Safri-17	150	3000	18	2982	150	13	137
	200	3000	18	2982	300	33	267
	250	3000	0	3000	0	---	---
	300	3000	8	2992	60	3	57
	Total	12000	44	11956	510	49	461
	Control	2400	0	2400	180	0	180
Mahsuri	150	3000	22	2978	120	19	101
	200	3000	9	2991	0	---	---
	250	3000	0	3000	0	---	---
	300	3000	26	2974	30	2	28
	Total	12000	57	11943	150	21	129
	Control	2400	0	2400	180	0	180
Dubraj	150	3000	0	3000	0	---	---
	200	3000	1	2999	30	6	24
	250	3000	0	3000	0	---	---
	300	3000	1	2999	30	11	19
	Total	12000	2	11998	60	17	43
	Control	2400	0	2400	120	0	120
Mahamaya	150	3000	0	0	0	---	---
	200	3000	0	0	0	---	---
	250	3000	0	0	0	---	---
	300	3000	0	0	0	---	---
	Total	12000	0	12000	0	---	---
	Control	2400	0	2400	0	---	---
G. Total of Seedlings (Excluding control)		48000	103	47897	720	87	633

R= Resistant S= Susceptible

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A Significant Contribution of Mutation Techniques to Rice Breeding in Indonesia

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Abstract: The use of mutation techniques in rice breeding was first introduced to Indonesia in 1966 by Dr. B.H. Siwi, after his fellowship training in Sweden awarded by the IAEA. However the first mutant rice variety, Atomita 1, was not officially released until 1982, though in-between several mutant lines performed very well in regional and national trials, with early maturity and high yield. The National Atomic Energy Agency (BATAN) is the only institute in the country that has the mission of research and development on mutation techniques for plant breeding. From 1982 to 2004, there have been 14 mutant rice varieties (11 lowland, 2 upland, and 1 tidal swamp rice variety) which were officially released in Indonesia, constituting more than 10% of the total number of released rice varieties during this time period. The number of variety itself cannot totally reflect the significant contribution of mutation techniques to the improvement of rice varieties in Indonesia; more importantly, are the improved traits in the new varieties, i.e. resistance to various biotypes of plant brown hoppers, tolerance to soil stresses (salinity, acidity, and high Fe concentration), in addition to other common traits such as early maturity (earlier than parent variety up to two months) and high yielding. Mutation techniques have proven particularly useful in traditional variety improvement, because no other techniques succeeded in improving their yield, disease resistance, or maturity, while keeping their quality characters unchanged. The breeding of a new mutant line, Pandanputri, and its superior performance to its parent variety is given as an example.

A brief history of rice breeding in Indonesia

Rice is the main staple food for most people in Indonesia, and is grown in lowland, upland, tidal swamp and swamp rice ecosystems. No breeding activities were reported before World War II, and farmers produced their own seeds for the next planting. After World War II, the Government initiated the official rice breeding programs, with the main objective to increase the yield potential, which is still valid until now. Before the IRRI's varieties were introduced and officially released, eighteen rice varieties were developed through cross breeding between the local varieties and germplasm introduced, mostly, from USA. These varieties were mostly of lowland type, maturing in 140 – 160 days, except Kartuna that matures in about 105 days. Seratus Malam[1] is the only upland rice variety that was officially released with the total growth duration of about 120 days. Those varieties can only be planted once per year, and are subject to lodging once high nitrogen fertilizer is applied.

IR5 and IR8 are the first IRRI's varieties that were released in Indonesia in 1967, which marked a new era in Indonesian rice production. From 1967 to 1981, 15 of the 35 rice varieties that were officially released were directly introduced from IRRI, while the others were developed through cross breeding by rice breeders in Indonesia (Table 1). Since the 1970's, IRRI's varieties have dominated rice production in Indonesia due to their high yielding potential and resistance to brown plant hopper (BPH). IR64 is still the largest rice plantation in Indonesia up till now. Pelita I/1 and Cisadane are the only two varieties that were bred by Indonesian breeders and grown as one of the leading varieties in Indonesia since 1970's.

Starting from the 1980's, the number of rice varieties that are directly introduced from IRRI and released in Indonesia has been gradually reduced, and all new varieties released after 2002 are developed in Indonesia. An important development in recent years is the rapid adoption of hybrid rice (Table 1).

Use of mutation techniques in rice breeding

Initiation of rice mutation breeding

The first commercial mutant variety in the world was produced in Indonesia. That was the tobacco mutant variety named "chlorina" bred by D. Tollenaar in 1929. He

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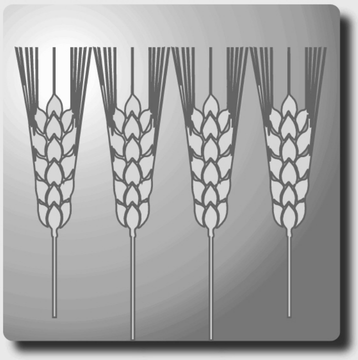

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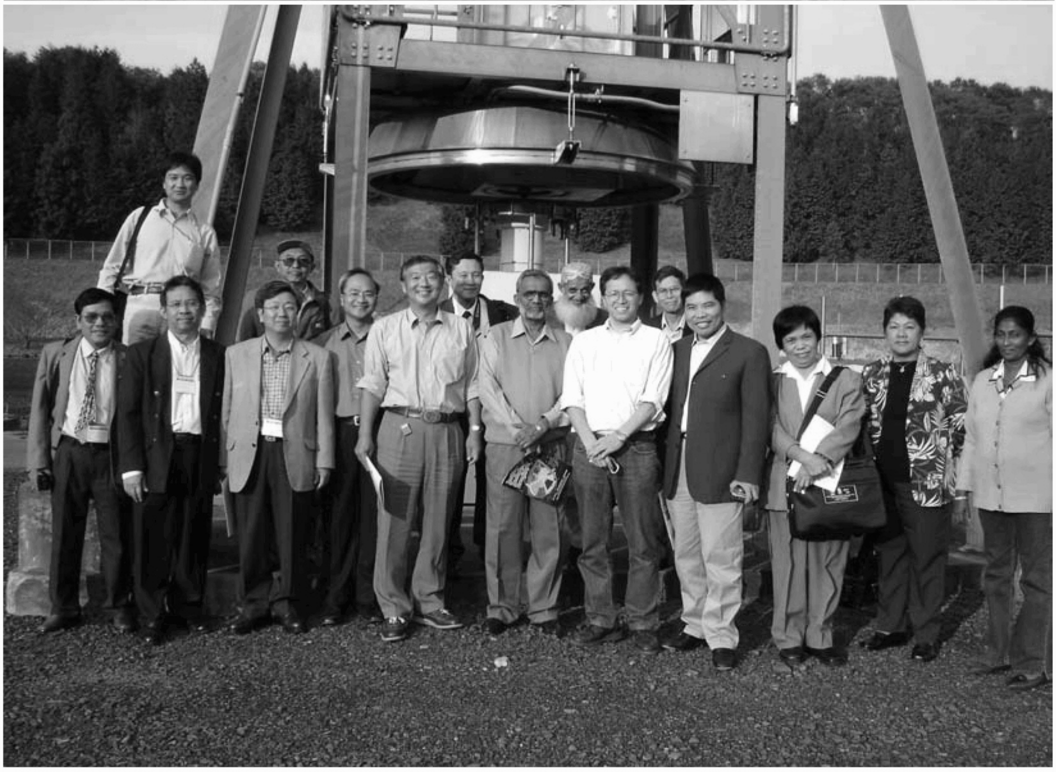

Participants visiting the Gamma Field of the Institute of Radiation Breeding, National Institute of Agrobiological Resources, Kamimurata, Hitachiomiya, Ibaraki, Japan

To Our Readers

Just before going to press, an administrative/technical issue prevented us from continuing to use the title, Mutation Breeding Newsletter and Review (MBN&R) for our publication. After discussions, we decided, from this issue on, to use the title, Plant Mutation Reports (PMR) to replace the MBN&R. This move was indeed in line with our planning, but occurred sooner that we expected (see To Our Readers, MBN&R No. 1). Thus, MBN&R No. 2 will be replaced by the present PMR Vol. 1, No. 1. Please accept our deepest apologies for any trouble this might cause. We will continue to strive to improve the quality of Plant Mutation Reports towards a periodical of higher scientific value, as a specialized international journal on plant mutation research and its application in crop improvement. Your comments and suggestions on this subject are very much welcomed and appreciated!

"Rice is Life" At its fifty-seventh session in December 2002, the United Nations General Assembly designated 2004 as the International Year of Rice (IYR), originally proposed by the FAO. The declaration reflects the importance of rice for global food security, poverty alleviation and sustainable development. Rice is the staple food of more than half of the world's population; rice cultivation, products and traditions attached to the crop have become an integral part of the world's cultural heritage. In most Asian countries, the significance of rice in people's daily life and culture is much more pronounced than on any other continents.