

RICE BREEDING AT BATALAGODA

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The urgency and the importance of increasing local rice production was recognized in the mid 1930s as a result of the severe shortage of food and foreign exchange experienced at that time. Improved varieties became a vital need for the realization of a production increase per unit area of land. Susceptibility to rice blast disease, poor response to fertilizer and weak stems, were three major defects common to local varieties, severely restricting the possibility of varietal improvement through pureline selection. Development of improved varieties through hybridization was considered the only logical approach for the correction of the above mentioned defects. Paddy Station Batalagoda, renamed in 1952 as the Central Rice Breeding Station Batalagoda of the Department of Agriculture, undertook and fulfilled a major part of this responsibility.

An extensive hybridization programme was initiated to meet the demand for four different maturity durations, ranging from 5–6 months to 3 months. With the identification of a few introduced varieties with better nitrogen response and other varieties with blast resistance, rapid progress was made.

OLD IMPROVED VARIETIES

The first success of the above rice hybridization programme H-4, (4–4 1/2 months) was released to farmers in 1958. Within a shortspell, because of its adaptability to a wide range of soil and environmental conditions and medium maturity duration, H-4 gained wide popularity and farmer acceptance. H-4 was soon followed by H-7 (3½ months), H-9 (5–6 months) and H-10 (3 months). The above varieties commonly called Old Improved Varieties (OIV) combined blast resistance with moderate response to fertilizer.

With the release of OIV, major changes in the patterns of local rice culture emerged. Losses from rice blast disease diminished, fertilizer use increased, and the traditional system of single cropping was replaced by double cropping (H-4 for the Maha Season. H-7 or H-10 for the Yala season). Low yielding Yala season Deveredderi was replaced by the higher yielding H-9. Increased cropping intensity led to increased production, A stagnant national average of 1.5 t/ha in the 1950s was elevated to 2.5 t/ha in the late 1960s.

The plant type of the OIV was similar to the traditional cultivars and responded only to moderate levels of fertilizers. At high fertilizer levels they still lodged. Identification of the dwarf plant type as exemplified by Taichung (Native) 1 and 1R 8, was a milestone in rice breeding. Lodging resistance, a

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much needed character to further increase the response of OIV to high levels of nitrogen became available with the newly discovered dwarf varieties. However, a sudden change from a low yielding, low input, traditional variety, to a high yielding, high input, fertilizer responsive, management intensive typical dwarf type was considered undesirable in view of the high management levels demanded by the new plant type yet not within reach of the local village farmer, traditionally accustomed to unimproved varieties. OIV bridged the transition from a low yielding traditional tall variety to a nitrogen responsive lodging resistant high yielding dwarf.

Development of lodging resistant, nitrogen responsive dwarf varieties with an increased yield potential dominated the objectives of the second phase of the hybridization programme at Batalagoda. Bacterial leaf blight resistance was an added selection criterion as the disease emerged as a further limitation to rice production.

NEW IMPROVED VARIETIES

The second stage of the hybridization programme produced a series of new varieties, Bg 3-5 (5-6 months) Bg 11-11 ($4\frac{1}{2}$ months), Bg 34-6 ($3\frac{1}{2}$ months), Bg. 34-8 (3 months), combining dwarf plant type, good levels of resistance to lodging and prevalent diseases. Under good management practices their yield potential approximated 7 t/ha, a significant improvement over the OIV. The new varieties rapidly gained popularity, extending to 55% of the total area cultivated to rice within a period of five years from their release. An early maturing traditional plant type variety, 62-355, produced at Batalagoda and purified at the Rice Research Station Ambalantota, was released for the rainfed areas of the dry-zone where good management levels are hard to obtain.

With the farmer acceptance of the dwarf plant type and changing management practices to suit the dwarfs, a further improvement of the yield potential was attempted and accomplished. Three new varieties Bg 90-2 ($4\frac{1}{2}$ months), Bg 94-1 and Bg 94-2 ($3\frac{1}{2}$ months), were released in mid 1970s. Yield potential of the new varieties under good management practices approached a record 10 t/ha.

Dwarf varieties now called Bg varieties, not only signified a change in the plant type, but also in management and input levels. With the said changes, problems of insect pests and damage increased. The new varieties though characterized by a high yield potential, yet lacked resistance to major common insect pests: pesticides increase production costs and lead to environmental problems. From mid 1970s, therefore, the hybridization program at Batalagoda concentrated on incorporating insect pest resistance to varieties with dwarf plant type, with emphasis on two major insect pests, gall midge (GM) and brown plant hopper (BPH).

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Two high yielding varieties Bg 400-1 (4-4 1/2 months), and Bg 276-5 (3 months) with resistance to gall midge were released in 1979. This was followed by the release in 1980 of the brown plant hopper resistant 4-4 1/2 months Bg 379-2. Parental sources resistant to rice thrips have also been identified and included in the hybridization programme. Search for resistant donors to other insect pests, such as leaf folder and stem borer continues.

IMPACT OF IMPROVED VARIETIES

At present, 85% of the total rice area is cultivated to improved varieties (65% NIV and 20% OIV). Soil and climatic problems such as drought or floods, salinity and iron toxicity limit a further extension of these varieties. Two new varieties, Bg 400-1, and 276-5, with tolerance to iron toxicity have been released to extend the area under NIV. Bg 3-5 released in 1973 has been only partially successful in replacing the traditional varieties in the low lying flood plains. Grain quality preferences limited its spread. Two new varieties, Bg 407 and 745, characterized by far superior grain quality should increase the area under NIV in the flood prone plains. For drought stricken areas, a 75 day maturing variety Bg 750 has been released.

The national average yield is increasing with the spread of new varieties. The current varietal development programme is focussed towards the development of varieties with adaptability to specific climatic and soil conditions, combining adequate levels of resistances to major common pests and diseases. A further increase over the yield potential already accomplished may not be possible. Yield and production stability and reduction of cost inputs through built-in resistances and tolerances to major diseases, insect pests and environmental constraints are being vigorously followed.

Hybrid Varieties Developed at Batalagoda

<i>Age Class (Months)</i>	<i>Name</i>	<i>Year of release</i>	<i>Pedigree</i>
5-6	H-9	1968	C104/Mas//Panduruwee
	Bg 3-5	1973	Panduruwee/Mas//Engatek
	Bg 407	1981	IR5/Panduruwee
	Bg-745	1981	71-554/Podiwee A8
4-4 1/2	H-4	1958	Murungakayan 302/Mas
	Bg 11-11	1970	Engatek *2/H-8
	Bg 90-2	1975	IR262/Remadja
	Bg 400-1	1979	Ob678//IR20/H-4
	Bg 379-2	1980	Bg96-3*2/Ptb33
3 1/2	H-7	1964	PP/Mas//H-5
	Bg 34-6	1971	IR8-246///PP/Mas//H-501
	Bg 94-1	1975	IR 262/Ld66
	Bg 94-2	1978	IR 262/Ld66
3	H-10	1968	PP/Mas//H-5
	62-355	1969	PP/H-5
	Bg 34-8	1971	IR8-246///PP/Mas//H-501
	Bg 276-5	1979	Ob678 *2/Bg34-8
2 1/2	Bg 750	1981	Ainantsao//75-1870/PP