

## SELECTION OF RICE VARIETIES FOR DOUBLE CROPPING IN THAILAND

Suvit PUSHPAVESA\*

### ABSTRACT

Selection of rice varieties suitable for double cropping in Thailand was actively initiated in the sixties. A series of semi-dwarf high-yielding varieties were released from the initial RD varieties with odd numbers designating the non-glutinous endosperm types and even numbers the glutinous ones, respectively.

Since 1969, eight non-glutinous varieties and three glutinous varieties have been released so far. Grain quality is among the top priorities for selection.

### Introduction

The first rice experiment station was established in 1916. Varietal improvement has been carried out since then. Rice varieties in areas near the station as well as those from other provinces were collected. Then, pure-line selection was practiced. The primary objective was to select for the grain quality. Maturity was one of the criteria for selection intended for single rice crop. The Thai government, with the help of the US, launched a nationwide program on rice improvement in 1950. Hundreds of thousands panicles were collected from farmers' fields all over the country. Still the collection aimed at the selection of varieties to be grown for single cropping.

Double cropping of rice was practiced on a small scale, in low-lying areas. Farmers planted the tall, photoperiod-insensitive varieties by the end of the wet season when water was still available. When irrigated areas were expanded in the sixties, cultivars such as Leuang Tawng were used for the dry season cropping. Their yields were low.

IRRI breeding materials including the line IR8-288-3, later named IR8, were introduced to Thailand in 1965. The line which was tested at Bangkhen Rice Experiment Station in the wet season yielded more than 6 t/ha (CHANDLER, 1982). The yield was attractive but the grain appearance did not appeal to the farmers.

### The RD series

Since IR8 was unacceptable to Thai farmers, the variety was crossed to the local Leuang Tawng. Two progenies were later named RD1 and RD3. The initial RD which in Thai stands for Rice Department had been adopted for naming the rice varieties since 1969. Odd and even numbers were used to designate the non-glutinous and glutinous varieties, respectively. When the Rice Department was relocated at the Department of Agriculture in 1972, it became a Rice Division but the use of RD initial still remained. Cultivars in the RD series include not only the semi-dwarf forms but also the traditional tall and the deep water rice varieties as well. The semi-dwarf varieties include the following:

#### 1 Non-glutinous endosperm type

RD1 and RD3: As mentioned above, these two varieties originated from the cross Leuang

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\* Plant Breeder and Assistant Director, Rice Research Institute Department of Agriculture, Bangkhen, Bangkok, 10900, Thailand.

Tawng/IR8.

RD1 tends to be slightly taller than IR8 and more resistant to tungro virus. Both varieties are similar in plant type, amylose content, and maturity. RD1 differs from IR8 by having long, slender, and clear grain.

RD3 is similar to RD1 in most characters. However, it has a longer and erect flag leaf, shorter stem, and brown rather than straw-colored hull. The release of RD3 was based on superior yields under low fertility (JACKSON *et al.*, 1969). The popularity of RD3 decreased rapidly due to its susceptibility to bacterial leaf blight.

RD7 was selected from the cross C4-63/Gow Ruang 88//Sigadis. The C4-63 parent is a short straw variety developed by the University of the Philippines at Los Banos. Gow Ruang 88 is the traditional tall variety and Sigadis is a disease-resistant cultivar from Indonesia. It was released in 1975.

RD7 has a good grain appearance and cooking quality. The amylose content in the endosperm is intermediate. The variety gained popularity for its grain quality and bacterial leaf blight resistance but the planted areas decreased after the epidemics of rice ragged stunt virus became severe.

RD9 is the progeny of Leuang Yai 34/T(N)1//W1256//RD2. The Leuang Yai 34 parent is the traditional tall variety. The W1256 is the insect-resistant line from Warangal, India. RD9 was released at the same time as RD7. It gained acceptance where infestation of brown planthopper is serious. Despite its long clear grain and early maturity, the variety is somewhat poor in cooking quality.

RD11 was released in 1977 as a possible replacement for RD1 due to its longer grain. It originated from the cross IR661/Khao Dawk Mali 105. The Thai parent is well-known for its grain quality. RD11 did not gain much popularity due to the long growth duration.

RD21 originated from the cross Khao Dawk Mali 105/Nahng Mon S-4//IR26. The Nahng Mon S-4 parent is a traditional tall variety with good grain quality. It was released in 1981 as a replacement of RD7 in areas where ragged stunt virus was a problem. The variety has a grain quality comparable to that of RD7 with a lower amylose content.

RD23, the progeny of RD7/IR32//RD1 was released at the same time as RD21 for the same purpose of replacing RD7. Farmers prefer RD23 to RD21 due to the higher quality of straw in the former.

RD25 is an early-maturing variety, released in 1981. The variety originated from the cross Khao Dawk Mali 105/IR2061//Khao Dawk Mali 105/IR26. RD25 is resistant to the brown planthopper. It gained popularity in the areas near the coastline where irrigation is available in the dry season. The variety grown as the second crop can be harvested before saline water penetrates through the irrigation canal. Its major defect is the susceptibility to neck blast.

## 2 Glutinous endosperm type

RD2 is a semi-dwarf glutinous variety developed from the backcross Gam Pai 15\* 2/T(N)1 bred and initially selected at IRRI. The variety was released at the same time as RD1 and RD3. RD2 inherited the glutinous endosperm from Gam Pai 15, the tall parent. RD2 has a good resistance to tungro virus but is highly susceptible to bacterial leaf blight.

RD4 is a semi-dwarf variety derived from the cross Leuang Tawng/IR8//W 1252/RD2. The variety W 1252 is the gallmidge-resistant line from Warangal, India. The variety was released for the northern region where rice gallmidge infestations occur frequently. RD4 has a poor cooking quality.

RD10 is a semi-dwarf cultivar selected from the fast neutron-treated population of RD1. Most of its morphological and physiological characteristics are similar to those of RD1, except for the type of endosperm.

The above-glutinous varieties were released as the second crop in the North and Northeast. But farmers in those regions usually grow the non-glutinous crop in the dry season. Actually

they grow enough glutinous rice for consumption in the wet season so that they prefer growing the non-glutinous rice that fetches a higher price in the dry season for cash.

Among all the non-glutinous varieties released so far, RD1, RD7 and RD23 are still in demand by farmers in the irrigated areas. There are some defects within each variety (Table 1). Further improvement is in progress for the sake of the rice farmers.

**Table 1** Some characteristics of varieties for rice double cropping

Variety	Maturity (day)	Length (mm)	Grain			Reaction to diseases				Reaction to insects			
			Width (mm)	Chalkiness	Amylose (%)	Bl	BB	RTV	RSV	BPH	GLM	SB	GM
RD 1	130-135	7.1	2.2	0.7	29-32	S	S	S	S	S	S	S	S
RD 2	130-135	7.4	2.6	G	G	S	S	MS	S	S	R	S	S
RD 3	125-130	7.5	2.3	0.7	29-32	S	S	S	S	S	S	S	S
RD 4	125-130	7.3	2.4	G	G	S	S	S	S	R	R	S	R
RD 7	120-130	7.2	2.2	0.8	23-29	MR	R	MS	MS	S	R	S	S
RD 9	120-125	7.2	2.3	0.9	29-31	S	VS	MS	MS	R	R	MS	R
RD10	130-135	7.6	2.3	G	G	MR	S	S	S	S	S	S	S
RD11	135-140	7.6	2.2	0.7	29-33	MR	S	S	S	S	S	S	S
RD21	120-130	7.3	2.3	0.2	16-21	S	MR	S	MR	R	MR	S	S
RD23	120-130	7.3	2.2	0.2	25-30	S	R	S	MR	R	MR	S	S
RD25	95-105	7.4	2.3	1.1	30-33	S	MR	S	MR	R	MR	S	S

Source: Rice Research Institute, Department of Agriculture.

## References

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- 2) JACKSON, B.R., PANICHAPAT, W. and AWAKUL, S. (1969): Breeding, performance, and characteristics of dwarf, photoperiod non-sensitive rice varieties for Thailand. *Thai J. Agr. Sci.*, **2**, 83-92.

## Discussion

**Abu Baker Taib** (Malaysia): What yield level can be attained by the varieties released to the farmers, in particular RD25?

**Answer:** RD25 gives the lowest yield among the HYVs in the RD series whose average yield is 4 tons per hectare. There is the problem of susceptibility to pests and diseases. However if the management is appropriate the yield of these varieties can reach 7-8 tons per hectare.

**Dat Van Tran** (FAO): 1. What is the most common RD variety grown in Thailand? What is the percentage of the acreage planted to this variety in Thailand? 2. What is the yield of RD21 grown by the farmer who received an award on the occasion of the 25th anniversary of IRRI foundation in 1985?

**Answer:** 1. RD1 is still widely grown due to its adaptation to the second cropping but its grain quality is inferior to that of RD7 which is preferred by the farmers. RD21 is resistant to the BPH and virus but there are problems with the straw. Presently RD23 is replacing RD7 in areas infected with ragged stunt virus. I can not indicate the percentage of the acreage planted to these varieties. 2. The farmer who received the award was able to obtain a yield of 10 tons for the single crop. The management applied in his farm was

highly sophisticated and he used chicken manure incorporated to soil.

**Soetjipto Partohardjono** (Indonesia): Do you encounter problems in grain quality in the second crop when maturity coincides with high rainfall and harvesting takes place in the rainy season?

**Answer:** The quality of the second crop is often lower. Indeed in the Central Plain water for the irrigation of the second crop is released late after the first crop is harvested. As a result the harvesting of the second crop takes place in the early part of the rainy season. Drying of grains is a problem since the farmers do not use driers. They are reluctant to invest money for a drier which is used only once a year. In addition the Thai farmers are very independent and do not tend to cooperate in farm activities.

**Khush, G.S.** (IRRI): What is the highest yield you obtained in the replicated yield trials.

**Answer:** It depends on the location. We obtained 10 tons per hectare.