

# **PROGRESS OF RESEARCH AND DEVELOPMENT OF HYBRID RICE IN VIETNAM**

**Dr Nguyen Tri Hoan**

**Field Crops Research Institute,  
Vietnam Academy of Agricultural Science**

**The 6<sup>th</sup> International Hybrid Rice Symposium  
Hyderabad, India 10-12.Sep.2012**

# **1. INTRODUCTION**

- **Since 2000 Vietnam conducted hybrid rice production on 1500 to 2260 ha per year with yield level of 2,0-2,7 tons/ha.**
- **The advantages of hybrid rice have been confirmed by high yielding, short duration, suitable for late spring rice crop and early summer crop of Vietnam.**
- **However, hybrid rice still shows disadvantages on grain quality, diseases and insect susceptibility. Furthermore, hybrid rice seed production in the Northern provinces also faces several problems, especially damages caused by changed climate.**
- **All these constraints prevented enlargement of hybrid rice seed production as well as hybrid rice production in Vietnam.**
- **In order to overcome problems of hybrid rice development, Vietnam has intensively invested in improving hybrid rice varieties as well as in hybrid rice seed production technology. The achievements and progress of hybrid rice research are presented and discussed in this paper.**

## 2. RECENT ACHIEVEMENTS



*Table 1 : Characteristics of newly developed CMS lines*

<b>CMS lines</b> Character	<b>IA/ BK<sub>7-8-2</sub>BC9</b>	<b>25A/ B<sub>8-3-1</sub>BC8</b>	<b>D62A/ R623BC 6</b>	<b>II32A/ OM2502<sub>13</sub>BC11</b>	<b>BoA/ BK25BC8</b>	<b>BoA/ BK<sub>1-5-1</sub>BC9</b>
Duration to heading 10 % (day)	74	71	65	75	71	67
Stigma exert.(%)	70-75	75-80	70-75	76-80	50-55	75-80
Panical/hill	8,9	11,4	10,2	10,2	10,8	10,3
Off type (%)	3	2	5	5	5	3
Plant height(cm)	76,3	87,6	75,2	81,6	62,4	73,5
Sterile pollen (%)	98	90	98,8	98,5	90	97
Phenotype Acceptability (score)	1	1	1	1	3	1
Grain shape.	Round	Long	Long	Long	Round	Long

## *2.2. Results of developing new tropical TGMS lines in Vietnam*

- **The new TGMS lines had stable pollen sterility under critical temperature of 23-24°C, uniform in phenotype combined with good combining ability**
- **Some newly developed TGMS lines have been used as female of promising two line hybrids viz. VL20, TH3-3, TH3-4, HC1, TH5-1, HYT103, HYT102, VL24 HYT106, HYT107, LHD5 and LHD6.**







## *2.3 Developed new TGMS based on adapted maintainer line and restorer lines of 3 line hybrids*

### **Aimed:**

- Overcome unstability of some exiting CMS
- Limited number of available CMS lines for 3 line hybrid system.
- Exploiting good flower characteristics, good combining of exiting parental lines

### *Parental lines used :*

- 4 TGMS lines were CL64S, 7S, CN26S, TG125S
- Maintainer lines were II-32B, Jin 23B, IR62829B, BoB, IR58025B, 97B,
- Restorer lines were Gui99, Ce64, Fuhui838.

***Table 2: Characteristics of newly developed TGMS lines derived from exiting CMS lines***

<b>TGMS lines</b>	<b>Duration to heading (days)</b>	<b>Plant height (cm)</b>	<b>Panicle/hill</b>	<b>Spikelet/panicle</b>	<b>Stigma exertion</b>	<b>Stigma color</b>
AMS 35S-45	87	65.3	7.4	194.0	Good	White
AMS 35S-46	87	73.7	7.0	227.7	Good	Black
AMS36S	85	77.0	8.0	173.7	Very good	Black
AMS 37S-76	72	63,3	6,6	197,3	Very good	Black
AMS 34S-10	72	67,7	8,5	156,0	Very good	Black



***Table 3: Characteristics of newly developed TGMS lines derived from exiting CMS lines***

Char. \ TGMS	AMS 35S-45	AMS 35S-46	AMS 36S	AMS 34S-10	AMS 34S-11	AMS 37S-76	AMS 30S(d/ c)
<b>Stigma color</b>	white	white	Black	Black	Black	Black	white
<b>Grain shape</b>	L	L	B	B	B	L	L
Panical length	22,3±8	21,3±7	22,0±6	18,7 ±8	18,7 ±7	21,3 ±7	-
<b>Panical./ hill</b>	5,0	8,4	6,6	10,4	10,4	6,6	5,4
<b>Spikelet/panicel</b>	272,7	177,3	204,7	183,0	173,7	234,3	158,0
<b>Spikelet under covered(%)</b>	7,1	3,9	2,8	7,1	10,2	5,0	-
<b>Off type (%)</b>	0	0	0,1	0	0,1	0	0
<b>Stigma exert.(%)</b>	60	60	72 - 75	70 - 72	70 - 72	70 - 72	70
<b>Sterile pollen (%)</b>	100	100	95 - 100	100	100	100	100
<b>Critical To to pollen Sterile</b>	23,5	23,5	24,0	24,0	24,0	24,0	23,5



37S - 77

37S - 76

36S - C7

34S - 11





## *2.4 Results of development for parental lines having WC gene*

- The conventional high yielding varieties, adapted to Vietnamese condition as Xi23, Q5, Chiem77, R242, BM9855 etc... were used as male to cross with donor having WC gene viz. Peiai 64S, N22, Palawan, Dular, Calotoc, Lambayeque1, Moroberecan.
- Single crosses were done and selection for parental lines followed 2 directions:
  - (i) Select fertile plant in segregating generation to male parent having WC gene
  - (ii) Selected sterile plants in segregating generations of single crosses or in back crossing generations.

***Table 4 : Characteristics of newly developed TGMS having WC gene (HRDC, 2005 - 2010)***

<b>Characters</b>	<b>D52S</b>		<b>D59S</b>		<b>D60S</b>		<b>D116S</b>	
	<b>spring</b>	<b>summer</b>	<b>spring</b>	<b>summer</b>	<b>spring</b>	<b>summer</b>	<b>spring</b>	<b>summer</b>
<b>Day no. to flowering</b>	82	62	86	64	82	62	86	64
<b>Stigma exertion (%)</b>	60	65	70	75	60	65	70	75
<b>Pollen sterile (%)</b>	100	100	100	100	100	100	100	100
<b>Fertile pollen(%)</b>	98	-	98	-	98	-	98	-
<b>Tiller No./hill</b>	9,0	14,0	9,5	15,0	9,0	14,0	9,5	15,0
<b>Plant height (cm)</b>	72,5	-	78,2	-	72,5	-	78,2	-



*Table 5: Characteristics of newly developed TGMS having WC gene (HRDC, 2005 - 2010) continued*

Characters	D64S		D66S		D67S		D68S		D161S	
	spring	summer	spring	summer	spring	summer	spring	summer	spring	summer
<b>Day no. to flowering</b>	98	62	102	64	100	62	94	64	96	62
<b>Stigma exertion (%)</b>	60	70	60	70	60	70	60	70	60	70
<b>Pollen sterile (%)</b>	100	100	100	100	100	100	100	100	100	100
<b>Fertile pollen(%)</b>	98	98	98	-	98	-	98	-	98	-
<b>Tiller No./hill</b>	9,0	14,0	9,5	15,0	9,0	14,0	9,5	15,0	9,0	14,0
<b>Plant height (cm)</b>	72,5	-	78,2	-	72,5	-	78,2	-	72,5	-

Table 6: Percentage of fertile pollen in 24°C and 25°C  
Treatment

Order	Name	% Fertile pollen		
		24°C	25°C	Temp.induced complete pollen sterile
1	<b>D52S (CL64S/Q5)</b>	0-2%	0%	BD ≤ 25°C
2	<b>D68S (CL64S//C70/CR203)</b>	0%	0%	BD ≤ 24°C
3	<b>D60S MTr (CL64S/Chiêm77)</b>	30-70%	1-20%	BD ≥ 25°C
4	<b>D60S MT (CL64S/Chiêm77)</b>	0%	0%	BD ≤ 24°C
5	<b>D59 (7S/Lemon)</b>	1-20%	0%	BD =25°C
6	<b>D161 (Peiai64S/IR62030//IR62030)</b>	30-80%	1-30%	BD >25°C
7	<b>D116 Mtr (CL64S/R242//R242)</b>	0-0,1%	0%	BD = 24°C
8	<b>D116MT (CL64S/R242//R242)</b>	0-0,1%	0%	BD = 24°C
9	<b>D67S MT (CL64S//GR272/Xi12)</b>	0-10%	0%	BD ≤ 25°C
10	<b>D67S big grain (CL64S//GR272/Xi12)</b>	0-10%	0%	BD ≤ 25°C
11	<b>D64S (7S//7S/W3)</b>	0-5%	0%	BD ≤ 25°C
12	<b>D01S -2 (TGST &gt;10 days)</b>	0%	0%	BD ≤ 24°C



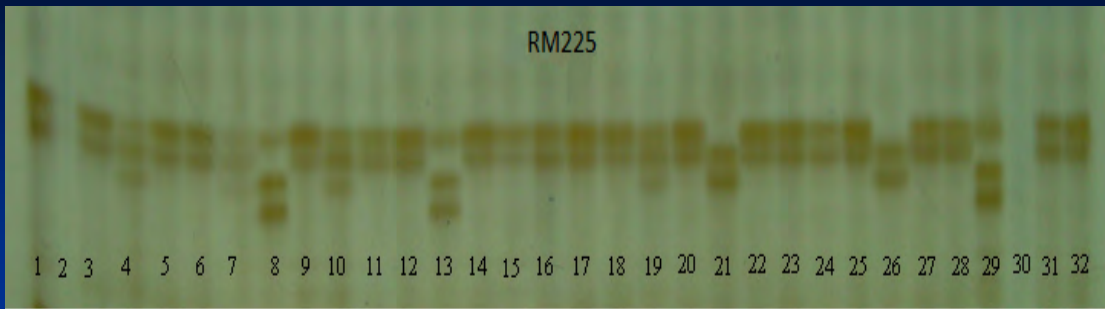
Đề tài lúa lai

D64S

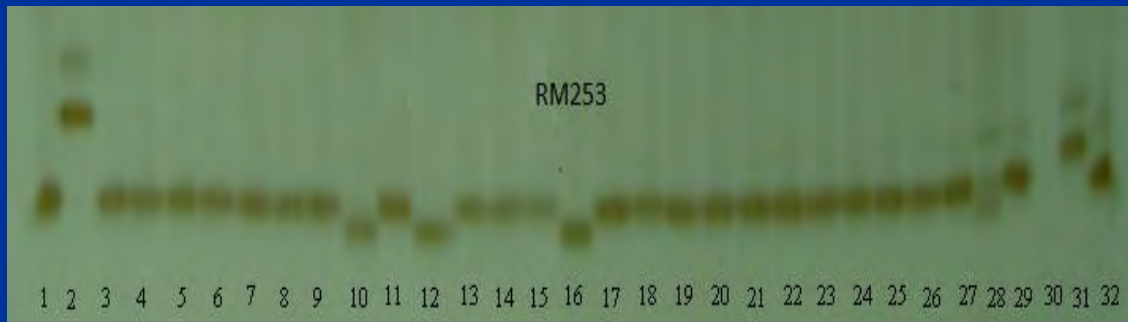
## **Selection of male lines containing WC**

Along with observation and study in field, leaves of the male lines were collected to analyse AND by using PCR reaction with molecular marker RM225, RM253, linked with WC gene which was determined in the previous study.

Using 2 molecular markers RM225 and RM253 to select lines which bring QTL/WC gene, showed in figure 21, 22 following:



*Figure21: PCR result with marker RM225.*



*Figure 22: PCR result with marker RM253*



**Combination two analyses result with two marker RM225 and RM 253, we obtained 16 perspective male lines which absolutely contain WC gene: D16-3, D27, D18-3, D22, , D27-5, D14, D25-2, D1-5, D17, D16-1, D16-6, , D26, D19, D52,D46 và D67.**

*Table 7: Yields for promising super hybrid rice (Indica/japonica), on the Spring 2008 at Hatay*

No.	Hybrids	Plant height (cm)	Growth duration to heading (days)	Yield (Ton/ha)	Type of hybrid
1.	D64S/RV126	102	97	11,44	Indica/japonica
2.	D60-3/RV126	98	91	9,93	Indica/japonica
3.	D59-4/RV114	105	105	9,54	Indica/japonica
4.	D52-5/RV114	106	101	9,41	Indica/japonica
5.	D59-4/RV126	104	97	9,72	Indica/japonica
6.	Er you 838	106	97	7,42	Indica/japonica
7.	<b>D66-1/R838</b>	<b>103</b>	<b>105</b>	<b>10,31</b>	<b>Indica/indica</b>
8.	<b>D59-1/R838</b>	<b>100</b>	<b>99</b>	<b>10,06</b>	<b>Indica/indica</b>
9.	<b>D59-1/R725</b>	<b>104</b>	<b>101</b>	<b>9,88</b>	<b>Indica/indica</b>
10.	<b>AMS30S/R8</b>	<b>105</b>	<b>97</b>	<b>9,62</b>	<b>Indica/indica</b>
11.	<b>D59-1/R253</b>	<b>105</b>	<b>105</b>	<b>9,00</b>	<b>Indica/indica</b>
12.	<b>33S/R1</b>	<b>104</b>	<b>95</b>	<b>8,87</b>	<b>Indica/indica</b>
13.	<b>31S/R36P</b>	<b>106</b>	<b>98</b>	<b>8,88</b>	<b>Indica/indica</b>
14.	<b>HYT83</b>	<b>105</b>	<b>98</b>	<b>8,22</b>	<b>Indica/indica</b>

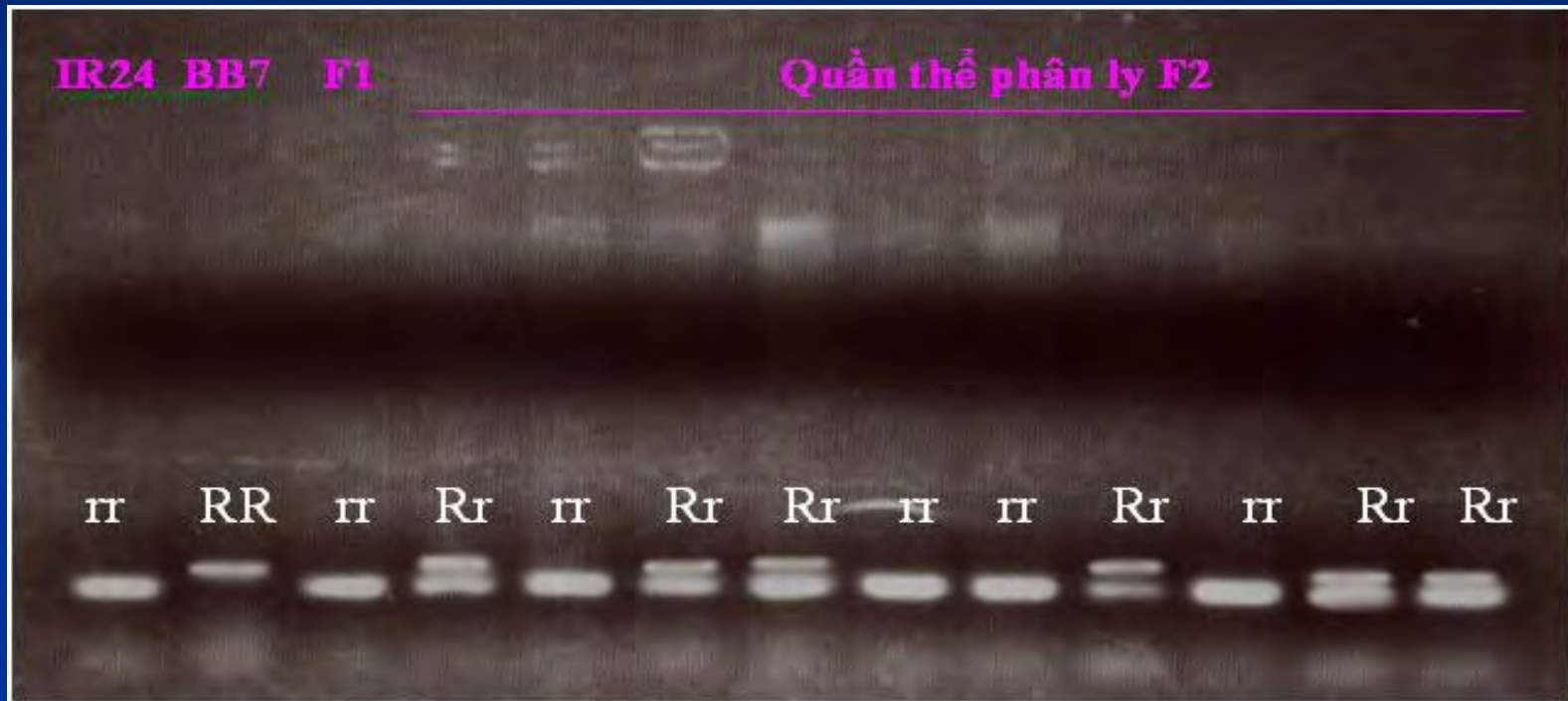


## **Determine the existence of molecular markers linked to the bacterial leaf blight resistance genes**

Check the existence of molecular markers (MM) linked to the bacterial leaf blight resistance genes. Extracting AND analysing PCR products to determine the diversity of parental lines:

- \* Two molecular markers (STS\_MP1, MP2) linked to the the bacterial leaf blight resistance gene Xa4
- \* One molecular marker (RG556) linked to the the bacterial leaf blight resistance gene xa5
- \* One molecular marker (P3) linked to the the bacterial leaf blight resistance gene Xa7
- \* Two molecular markers (PTA818, PTA248) linked to the the bacterial leaf blight resistance gene Xa21

# Molecular marker linked to gene Xa7 (STS – P3)



*Figure 2: PCR products of gene Xa7 from parental lines, F1, F2 of IR24 x IRBB7*



# Molecular marker linked to gene Xa21 (pTA818)

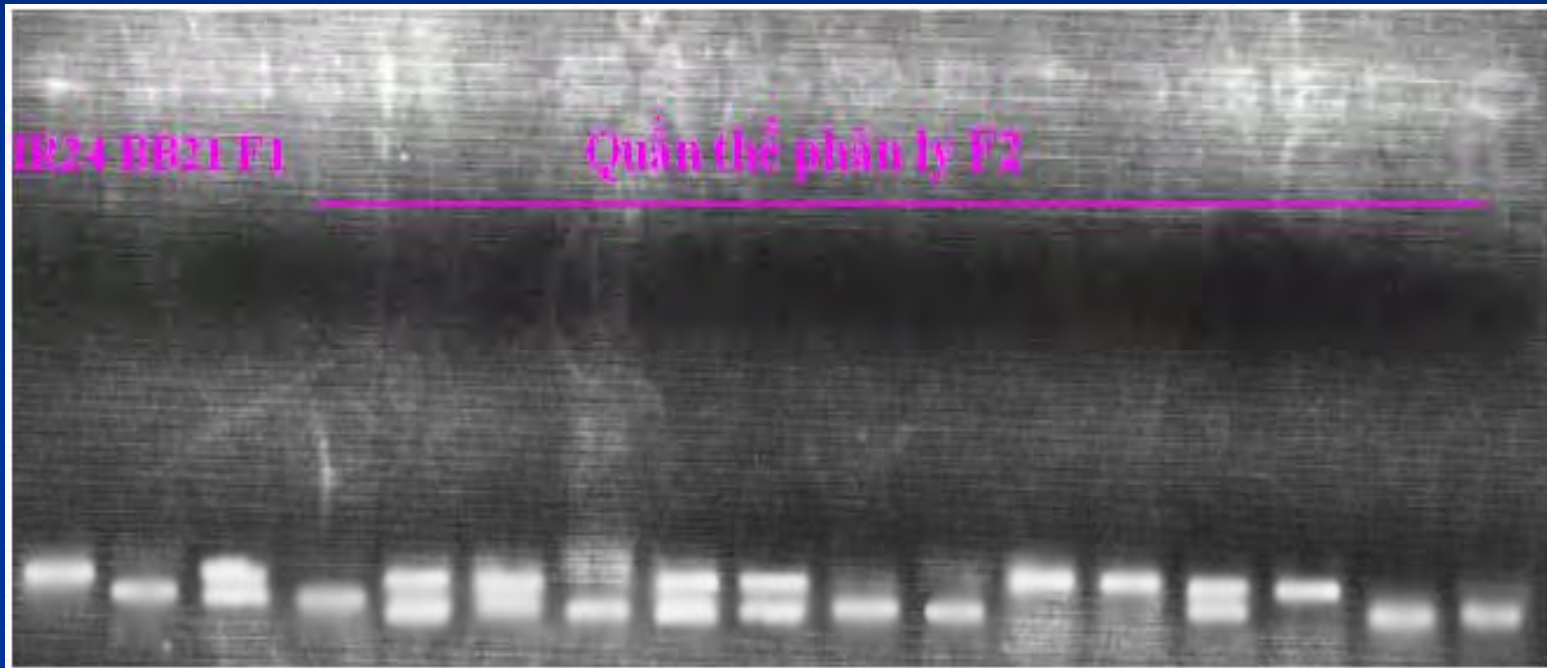


Figure 3: PCR products of gene Xa21 from parental lines,  
F1, F2 of *IR24* x *IRBB21*

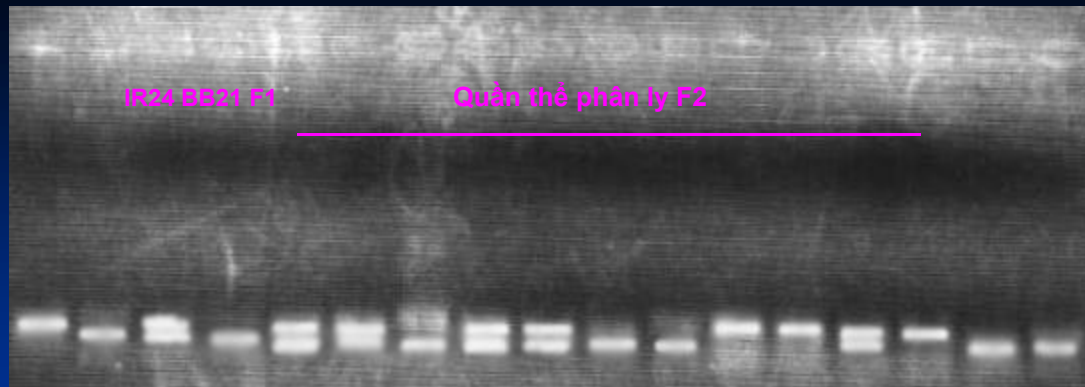
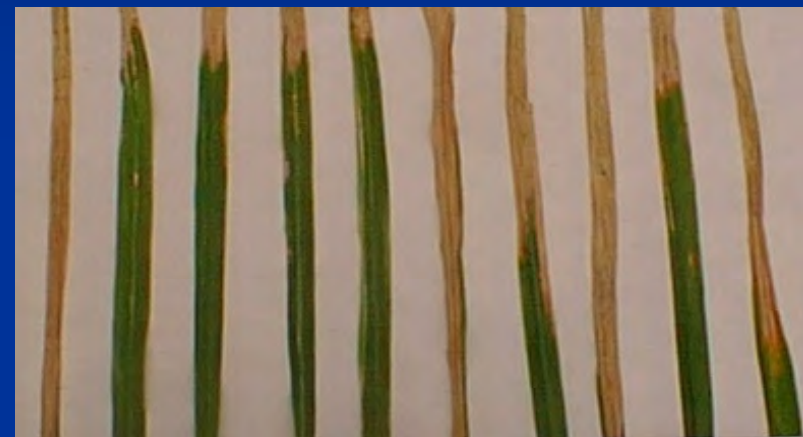


Figure 5: : PCR products of gene Xa21 from parental lines, F1, F2 of **IR24 x IRBB21**

Figure 6: Hình ảnh lây nhiễm nhân tạo chủng 4 trên gen Xa21



IR24 BB21 RR RR Rr rr rr rr Rr rr



IR24 xa5 Rr rr rr Rr RR rr rr RR

Figure 7: Hình ảnh lây nhiễm nhân tạo chủng 4 trên gen xa5

**Using PCR to determine the apperance of Xa4,xa5, Xa7 and Xa21 in TGMS lines  
(Autumn 2009)**

**Table 8: Selection of bacterial leaf blight resistance in female lines**

Crosses	Number of plant	Gene Xa4			Gene xa5			Gene Xa7			Gene Xa21		
		-	- +	+	-	- +	+	-	- +	+	-	- +	+
V102	10	7	3		10			10			10		
V115	9	6	2	1	9			8	2		9		
V121	7	7			4	2	1	7			7		
V122	10	5	3	2	5	2	3	10			10		
V123	11	6	2	3	11			8	3		11		
V125	6	6			6			6			3	3	
V128	10	10			6	2	2	10			10		
V130	7	5	2		7			7			4	3	
V133	10	10			5	3	2	10			7	3	
V138	5	1	3	1	5			5			3	2	
V140	11	11			11			5	6		7	4	

*Ghi chú: - : No gene*

*+: Contain gene*

*- +: Heterozygous*

**Table 9: Using PCR to determine the appearance of Xa4, xa5, Xa7 and Xa21 in Restorer lines (Autumn 2009)**

Tổ hợp	Number of plant	Gene Xa4			Gene xa5			Gene Xa7			Gene Xa21		
		-	- +	+	-	- +	+	-	- +	+	-	- +	+
BB5/R23	6				5	1							
BB4/RTQ5	10	8		2									
BB11/RTQ5	6	6			6			6			6		
Chệt Cụt/RTQ5	7	7			7			7			7		
Chệt cụt/R838	8	8			8			8			8		
BB11/R23	7	7			7			7			7		
BB21/Đặc thanh	8										6	2	
Chùm bông/Đặc thanh	6	6			6			6			6		
BB8/4492	8	7	1		8			8			8		
BB5/Q99	9				6	3							
BB13/Quế 99	7	7			7			7			7		
BB4/4492	9	4	2	3									
BB4/R242	10	7	1	2									
BB15/Trắc 64	8	8			8			8			8		

Note: - : No gene

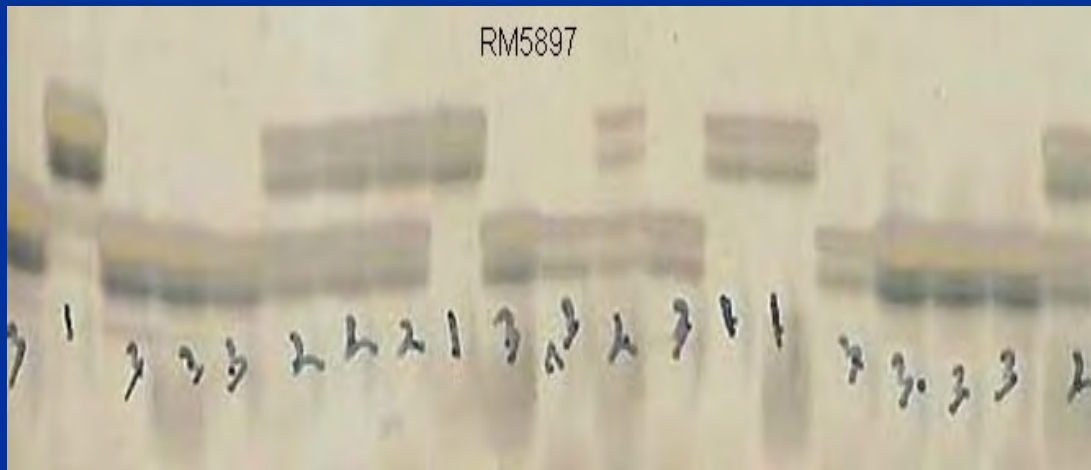
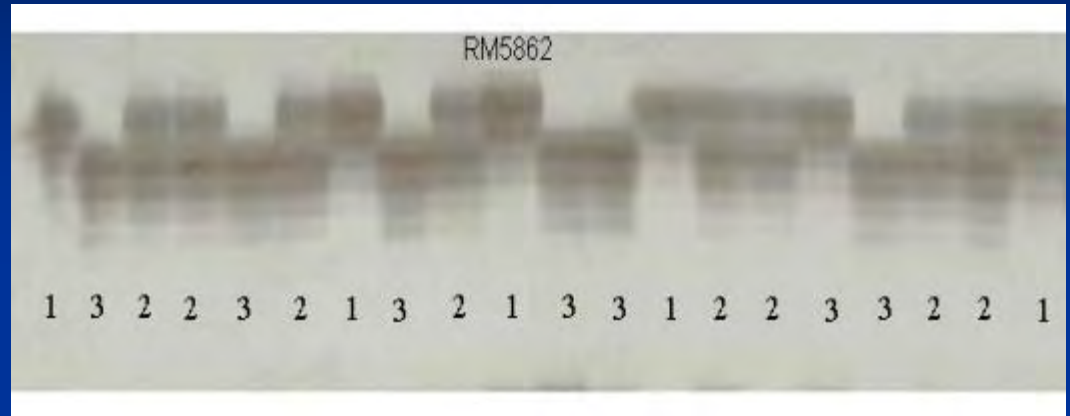
+: Contain gene

- +: Heterozygous

**Result of inherity checking by using molecular marker in F2 and parental lines CL64S, R242.**

**Figure 8. PCR result with marker RM5862.**

**1=CL64S, 2= *Heterozygous*, 3=R242**



**Figure 9. PCR result with marker RM5897**



**Chosing 10 perpective lines in F12BC2 by using molecular marker, namely 35s1-6, 35s49, 35S, 35s-51, 35s-20, 37s77, 34s-17, 34s -1MC, 34s -11, 34s -2MC. Obsevative result in fields showed that all 10 TGMS lines had pollen sterile 100% in natural temperature condition at more than 25°C in autumn 2010.**



*Figure 8: Using molecular marker RM6997 to select lines containing resistant gene.*

*Lane 1: line SL10, lane 2: line RS, lanes 3-8: line E1, E3, E5, E6, E7, E8*

*Figure 9: Investigate resistant level in fields. Green area was E-3 and E-8 line. Brown area was control line which was infected by BPH*



**Table 10 : Average yield of National trial experimental of some promising combinations in different 5-9 locations (2006-2010)**

STT	Season	Crosses	Average yield (Tạ/ha)	Loại tổ hợp lai	TGST (days)	Note
1	Spring 2006	<i>HYT 102</i>	<i>62,1</i>	<i>2 lines</i>	<i>125</i>	
2		<i>HYT 103</i>	<i>64,6</i>	<i>2 lines</i>	<i>124</i>	<i>Good quality</i>
3		<i>HYT 106</i>	<i>61,5</i>	<i>2 lines</i>	<i>126</i>	<i>Good quality</i>
4		<i>HYT 107</i>	<i>62,6</i>	<i>2 lines</i>	<i>128</i>	
5		<i>HYT 105</i>	<i>62,6</i>	<i>3 lines</i>	<i>128</i>	<i>Average quality</i>
6		<i>ĐC(N.U' 838)</i>	<i>62,7</i>	<i>3 lines</i>	<i>130</i>	<i>Average quality</i>
7	Spring 2007	<i>HYT 102</i>	<i>74,0</i>	<i>2 lines</i>	<i>125</i>	
8		<i>HYT 103</i>	<i>74,0</i>	<i>2 lines</i>	<i>125</i>	<i>Good quality</i>
9		<i>HYT 106</i>	<i>77,0</i>	<i>2 lines</i>	<i>126</i>	<i>Good quality</i>
10		<i>HYT107</i>	<i>75,0</i>	<i>2 lines</i>	<i>128</i>	
11		<i>ĐC(N.U' 838)</i>	<i>62,7</i>	<i>3 lines</i>	<i>130</i>	<i>Average quality</i>

**Table 11: Results of developing new hybrid for commercial hybrid rice production 2006-2010 (continue)**

<b>STT</b>	<b>Season</b>	<b>Crosses</b>	<b>NSTB (Tạ/ha)</b>	<b>Loại tổ hợp lai</b>	<b>TGST (days)</b>	<b>Note</b>
12	<i>Spring 2008</i>	<i>HYT 106</i>	<i>73,8</i>	<i>2 lines</i>	<i>126</i>	<i>Good quality</i>
13		<i>HYT 115</i>	<i>75,3</i>	<i>2 lines</i>	<i>128</i>	
14		<i>HYT 116</i>	<i>74,3</i>	<i>2 lines</i>	<i>130</i>	
15		<i>SL 8H</i>	<i>75,9</i>	<i>3 lines</i>	<i>135</i>	<i>Good quality</i>
16		<i>HYT 92</i>	<i>70,8</i>	<i>2 lines</i>	<i>135</i>	<i>Very good quality</i>
17		<i>II32S/MK 63</i>	<i>70,9</i>	<i>2 lines</i>	<i>135</i>	
18		<i>33S/PM3</i>	<i>75,3</i>	<i>2 lines</i>	<i>135</i>	
19		<i>ĐC(N.U' 838)</i>	<i>69,1</i>	<i>3 lines</i>	<i>130</i>	<i>Average quality</i>
20		<i>Spring 2009</i>	<i>HYT 115</i>	<i>72,5</i>	<i>2 lines</i>	<i>135</i>
21	<i>HYT 106</i>		<i>73,2</i>	<i>2 lines</i>	<i>126</i>	<i>Good quality</i>
22	<i>HYT 119</i>		<i>68,2</i>	<i>2 lines</i>	<i>135</i>	<i>Easy in F1 production</i>
23	<i>AMS30S/ R128</i>		<i>72,4</i>	<i>2 lines</i>	<i>136</i>	
24	<i>ĐC(N.U' 838)</i>		<i>70,5</i>	<i>3 lines</i>	<i>139</i>	<i>Average quality</i>

Table 12 : The hybrids resistance to BPH have been developed

No.	Hybrids	Mark	Resistant level
1	HYT102-(CNSX Thử)	3	MR
2	HYT108(CNSX Thử)	5	LS
3	LHD6(CNSX Thử)	3	MR
4	827S/RTC	3	MR
5	827S/R544	3	MR
6	25S-51/GR10	3	MR
7	25S-49/BB4-Q99	4	MR
8	HYT106(KNQG 3 vụ triển vọng)	6	S
9	D52S/RV114 (KN)	3	MR
10	827S/WC17(KN)	2	HR
11	10-63/(BL14/R242)	3	MR
12	Kim77S/BB60	3	MR
13	D52S/R16	3	MR
14	TN1 (S)	9	HS
15	SWanata (R )	2	HR



**Table 13: Quality analysis of hybrid rice combinations in summer season 2010****(Plan physiology and biochemistri agro product quality departement-HRDC)**

Hybrids	Grain humidity (%)	Unpolished Rice (%)	Husked rice (%)	Whole grain (%)	White of endosperm (%)	Grain length mm	Size classification	D/R	Type of grain	Protein (%ck)	Amylose (%ck)	score of alkali destroy	T0 of starched
HYT102	12,8	81,0	67,5	51,5	1-5	6,58	TB	2,64	TB	8,6	21,6	3,5+	M
HYT103	12,6	80,8	69,0	48,4	1-5	6,83	D	2,66	TB	8,9	18,8	2,0	H
HYT106	12,7	81,2	71,1	62,3	5-9	6,53	TB	2,90	TB	8,9	17,8	1,0	H
HYT108	12,5	80,6	70,5	63,9	5-9	5,91	TB	2,43	TB	8,6	21,4	3,0+	H
HYT115	12,6	81,9	71,7	61,6	1-5	6,67	D	2,89	TB	8,8	18,2	1,0	H
HYT119	12,5	79,3	70,1	63,7	0-1	6,05	TB	2,64	TB	9,0	21,2	1,5	H
HYT120	12,4	79,4	69,0	55,1	1-5	5,94	TB	2,59	TB	8,6	21,2	2,0	H
HYT121	12,5	81,7	70,0	42,8	1-5	6,08	TB	2,50	TB	9,0	21,4	6,0	L
HYT122	12,5	79,7	68,4	48,4	1-5	6,70	D	2,77	TB	8,4	18,8	2,0	H
HYT117	12	80,0	69,5	67,5	1-5	6,71	D	2,80	TB	8,1	23,6	2,0	H

**Table 14: Results of National testing and registration 2006-2010**

Hybrids	Type of hybrid	Level of release	remark
HYT 100	3 line hybrid, quality	Registration	Hai phong sees company
HYT 102	2 line hybrid	Registration	Hai duong seed company
HYT103	2 line hybrid	Registration	Dai duong seed com pany
SL 8H	3 line hybrid, quality	Registration	Dai thanh seed company
HYT1'08	2linehybrid, high yield	Registration	Thai Binh, Central seed company. Eakkar seed center
TH3-5	2 line hybrid	Registration	HAU
TH7-2	2 line hybrid	Registration	HAU
HYT 109	2 line hybrid	National testing	
HYT116	2 line hybrid	Promising hybrid	
HYT117	2 line hybrid	Promising hybrid	
HYT118	2 line hybrid	Promising hybrid	
HYT115	2 line hybrid	Promising hybrid	
LHD 6	2 line hybrid	Registration	Hanam seed company
LHD7	2 line hybrid	Promysing hybrid	
HYT121	2 line hybrid	Promising hybrid	



Table 15: Results of TGMS multiplication at different locations

TGMS lines	locations	Seeding dates	Heading dates	Seed setting
AMS 30S	Thanh Trì – Hà Nội	16-30/11	28/3-10/4	good seed set.
	Ba Vì – Hà Nội	16-30/11	28/3-10/4	good seed set.
	Mộc Châu-Sơn La	15-20/6	18-22/9	good seed set.
	Quảng Nam	9-21/1	20/3	Sterile
	Eakar - Đắk Lắk	8-21/1	25/3	Sterile
	Eakar - Đắk Lắk	15/10	25/12	Very good seed set
AMS 34S	Quảng Nam Eakar - Đắk Lắk	9/1-22/1	15/3-30/3	Good seed set.
ANS 35S				
AMS 36S				
AMS 37S				
AMS 35S	Mộc Châu – Sơn La	15-20/6	15-20/9	Good seed set.
AMS 36S	Ba Vì – Hà Nội		28/3 – 10/4	Good seed set.
AMS 37S	An Khánh – Hà Nội		28/3-10/4	Good seed set.

Table 16: Results of f1 seed production at Eaka - Đăklăc, Spring 2010

Hybrid	Transplan ting male par.	Heading date	Days to heading 10% (days)	Yield (kg/ha)	Remark
<b>4. HYT108</b>					
	R1	23/2/10	18/4/10	79	3000 Ruộng bị ngập úng
	R2	3/1/10	22/4/10	79	
	R3	3/1/10	24/4/10	77	
	mẹ (sạ)		22/4/10	74	
<b>5. HYT103</b>					
	R1	23/2/10	25/4/10	86	1700 -3000
	R2	1/3/10	27/4/10	84	
	R3	1/3/10	28/4/10	83	
	mẹ		22/4/10	74	
<b>6. HYT106</b>					
	R1	23/2/10	18/4/10	79	3000 Sản xuất trên chân đất mạ
	R2	1/3/10	20/4/10	77	
	R3	1/3/10	23/4/10	76	
	mẹ (sạ)		17/4/10	69	



Table 17: Results of f1 seed production at Eaka - Đăklăc, Spring 2010

TT	Hybrids	Tránsplan ting male par.	heading	Days to heading 10% (days)	Yield (kg/ha)	remark
<b>1. HYT83</b>					<b>3000</b>	<b>Dòng mẹ bị ngập úng</b>
	R1	30/1/10	2/4/10	87		
	R2	3/2/10	4/4/10	85		
	R3	6/2/10	6/4/10	85		
	Mẹ (sạ)		2/4/10	91		
<b>2. HYT92</b>					<b>2500</b>	
	R1	26/1/10	7/4/10	96		
	R2	30/1/10	9/4/10	94		
	R3	3/2/10	12/4/10	94		
	Mẹ (sạ)		8/4/10	90		
<b>3. HYT100</b>					<b>1500 -2000</b>	<b>Mẹ trỗ trước bổ1, 4 ngày</b>
	R1	28/1/10	3/4/10	88		
	R2	1/2/10	6/4/10	86		
	R3	5/2/10	10/4/10	88		
	Mẹ (sạ)		30/3/10	88		

**Table 18: Area, yield of hybrid rice commercial production in Vietnam during 2000 – 2011 (source MARD, 2012)**

	A year		Spring Season		Summer season	
	Area (ha)	Yield (ton/ha)	Area (ha)	Yield (ton/ha)	Area (ha)	Yield (ton/ha)
<b>2000</b>	435.508	6.45	227.615	6.50	207.893	6.37
<b>2001</b>	480.000	6.44	300.000	6.60	180.000	6.30
<b>2002</b>	500.000	6.30	300.000	6.50	200.000	6.00
<b>2003</b>	600.000	6.30	350.000	6.45	250.000	6.00
<b>2004</b>	577.000	6.04	350.000	6.45	277.000	5.40
<b>2005</b>	660.000	6.81	350.000	6.4	252.000	5.36
<b>2006</b>	584.200	6.32	346.000	6.5	238.000	6.15
<b>2007</b>	610.000	6.72	390.000	6.8	230.000	6.3
<b>2008</b>	581.361	6,8	326384	-	254977	-
<b>2009</b>	709270	6,5	404160	67,3	305110	5.7
<b>2010</b>	605642	6,85	374342	68,5	231200	6.0
<b>2011</b>	595000	6,70	395190	70,0	200000	6.2

**Table 19: Area of hybrid rice seed yield and F<sub>1</sub> seed production produced in Vietnam during 2000 – 2011 (source MARD, 2012)**

Year	Area (ha)	Yield (kg/ha)	Output (ton)
2000	620	2.300	1.426,00
2001	1.450	1.700	2.400,00
2002	1.600	2.400	3.840,00
2003	1.700	2.05	3.485,00
2004	1.500	2.15	3.225,00
2005	1.500	2.1	3.150,000
2006	1.915	2.02	3.866,800
2007	1.900	2.0	3.800,000
2008	1200	2,2	2640,000
2010	1525	2,5	3812,500
2010	2200	2,7	5940,000
2011	2260	2,2	4972,000

# Area of F1 seed production decreased:

- -Subsidized fund from government declined to 250 USD/ha and cost of fertilizers increased
- -Crops damaged due to changing climate
- -The cooperatives involved in F1 seed production lead to difficulties to distribute F1 seeds
- -Lack of good cooperation between research and seed production companies

### **3. ISSUES IDENTIFIED FOR FUTURE RESEARCH AND DEVELOPMENT OF THE TECHNOLOGY**

- ✓ Lack of hybrid rice combination with good grain quality, tolerant to pest and diseases, short duration (105 – 110 days) that meet requirements of the various agro-ecological zones of the country.
- ✓ Limited genetic materials needed to developed hybrid rice suited to south Vietnam and with resistance to pests and diseases during the summer crop in the North.



- ✓ Lack of strong local seed production system involving private sectors
- ✓ Lack of good cooperation between Hybrid rice Breeders and seed companies
- ✓ Lack of building optimum locations for investing in F1 seed production
- ✓ Reluctance of small farmers to locally produce hybrid rice seeds due to greater risk, very high financial requirement, lack of proper warehouse, space and cold storage for unsold seeds and farmer preference for imported seeds.





HYT 83

Diện Rộng Vụ Xuân 2005  
Giao Tiên Giao Thủy Nam Định

18.6.2005



### 3. hyt100



- TGST: vô mĩa 110-112 ngày, vô xu©n 125-130 ngày.
- Năng suất: trung bình 75-80 t<sup>1</sup>/ha, th©m canh cao 90t<sup>1</sup>/ha.
- Chèng chĐu: nhiÔm s©u bÖnh nhÑ, chĐu rĐt, chèng  æ kh<sub>2</sub>.
- ChÊt l-îng: *G'õ trong, bãng, c m mÒm, ngon, c  mii th m nhÑ.*
- C  c u: C y  -íc vô trong n m: xu©n muén - mĩa sím, chñ y u xu©n muén.





# HYT108

Spring 120-125; Autumn: 100-105 days

Yield: 7-9 ton/ha



**Grain of HYT100 & HYT 83**





Thank You!

KHU SẢN XUẤT GIỐNG GỐC BỐ MẸ LÚA LAI