Hybrid Rice in India Current status and future prospects



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Rice in India

- * Staple food for two thirds of Indians
- Occupies 22% of cropped area
- Grown in 44 m.ha
- **Production: 93.0 m.t.**
- * Contributes 25% to Agril. GDP
- Earns a foreign exchange of US \$ 18 billion
- ***** Rice is 'LIFE' to Indians

The Need for Hybrid Rice

- Rapidly increasing population
- Plateuing yield trend of HYV's.
- Requirement of 125 m.t. by 2025



Unavailability of Labor

Declining resources (Land, Water)

Hybrid Rice is one of the practically feasible and readily adoptable options to enhance productivity of rice.







Hybrids Released

- ***** Total Number of hybrids evaluated = 1800
- ***** Total Number of Hybrids Released = 33
- ✤ No. of central releases = 11 (8 Private + 3 Public)
- **No. of state releases = 22**
- No. of hybrids released by Public sector = 25
- No. of hybrids released by Private sector = 8

Pusa RH-10

First aromatic rice hybrid



Pusa Basmati 1

HKK (%)	: 54
KL (mm)	: 7.03
L/B	: 4.04
KLAC (mm)	: 12.9
ER	: 1.75
AC %	: 22.5
Aroma	: SS

: 71

Milling (%)

Promising hybrids in multi-
location trialsI PhaseII PhaseKRH-2PA-6444PHB-71JKRH-401SahyadriDRRH-2PA 6201PSD-3

)	Popular hybrids grown in the Country					
	PA- 6444	PHB-71				
	PA-6201	Suruchi-5401				
	KRH-2	Sahyadri				
	Pusa RH 10	JKRH-401				
.	addition to these	a valaaged bybyide 20.4				

In addition to these released hybrids 30-40 truthfully labeled hybrids from private sector are being cultivated in the country.

Hybrids for unfavorable conditions					
Abiotic Stress Promising Hybrids					
Rainfed uplan	d DRRH-2, PSD-3, PSD-1, KJTRH-4				
Salinity	DRRII-28, PSD-3, KRII-2, HRI- 148, JRH-8, PHB-71				
Alkalinity	Suruchi, PHB-71, JKRH-2000, CRHR-5, DRRH-2, DRRH-44				



	Hy	bri sle	ds v end	vitl er ş	n medium grains
Hybrid	Gra yie	nin Id	Grain o tra	juality its	
	t/ha	Adv	HRR	AC	
	61	(%)	(%) 67	(%) 23.8	
DKKII-44	0.1	35	07	23.0	NET DE MANY PERSONNE DE LA COMPACTACIÓN DE C
27P11	5.8	26	70	22.9	
BPT 5204	4.6	-	68	23.4	Down the Winds Winds
					DRH-44



- * Parental line improvement
- * Development of two-line hybrids
- Development of *indica/japonica* inter sub-specific hybrids

D)evel	opn	nent o	f Restorers
Cross	Number Developed	of lines Tested	Freq. of R (%)	
RxR	350	150	63	
R x R x R	160	105	58	
R x PR	480	250	41	Promising R-line
R x (PR x R)	140	90	52	r romong renne
R x (PR x PR)	135	80	39	
				A MARCA

Development of maintainers							
Type of cross	Number	of lines	Freq. of B(%)				
	Developed	Tested					
$B_1 \times B_2$	405	200	65				
B ₁ x PM	150	75	40				
$B_1x(B_2xB_3)$	135	60	56	Promising P line			
B ₁ x(PM x B ₂)	120	70	48	Promising B-line			
B ₁ x(PM ₁ xPM ₂)	115	55	41	SUL WY			
B ₁ x PM//PM	126	40	35				

C	lene	pool
Population	No.	of lines
	Added	Developed
Restorer Popula	tion	
DRCP 101	12	125
DRCP 102	10	115
DRCP 103	14	110
Maintainer popu	ilation	
DRCP 104	08	70
DRCP 105	10	90
DRCP 104	08	70

Status of utilization of new parental lines

Status of utilization	No. of
	entries
No. of hybrids released	03
No. of hybrids in the national trials	20
No. of hybrids in station trials	250
No. of lines in hybrid seed production	120
No. of new CMS lines developed	17
No. of B lines in CMS conversion program	50
No. of breeding lines released as varieties	05

Promising CMS Lines							
Centre	CMS lines						
Kapurthala	PMS 3A, 10A, 12 A, 17A						
Delhi	Pusa 3A (Basmati), Pusa 5A, Pusa 6A						
Hyderabad	DRR-7A, DRR-8A, 12A						
Maruteru	APMS 6A, 8A, 9A						
Cuttack	CRMS 31A, 32A						



TGMS lines developed in India

S.No.	Centre	TGMS Line	Special features
1.	Coimbatore	CBTS-0248	Mid-Early duration,
			good stigma exsertion
		CBTS-0252	Medium, good stigma exsertion
2. Hyderabad		DRR-5S	Medium duration, Mid-Early duration, good quality
		DRR-13S	Medium duration, Good grain quality, good stigma exsertion
3.	Maruteru	MTUS-22	Long duration, good quality
		MTUS-27	Medium duration, good stigma exsertion
4.	Pantnagar	UPRI-97-58	Early duration, good stigma exsertion
		UPRI-97-59	Early duration, good quality

Promisin	ng two-line hybi	r ids
	Нургіа	% field adv.*
	IR 73834-21 / ICRD-16-7-1	19
	IR 73827-23 / Salivahana	18
	DRR 1S / JGL-384	13
A Promising	IR 73834-21 / APMS-6B	12
two-line hybrid	IR 73827-23 / BCW-56	7

Application of molecular markers in Hybrid rice

- Identification and introgression of fertility restorer genes
- Assessment of purity of seeds of hybrids and parental lines
- Introgression of biotic stress resistance genes into parental lines
- Introgression of yield contributing QTLs into parental lines
- Deployment of wc genes for developing intersubspecific indica / tropical japonica hybrids.







Wide compatible parental lines identified							
Parents	#	S-5 ⁿ	S-8 ⁿ	Both			
CMS lines	20	12	19	12			
Restorers	15	06	15	06			
Varieties	22	14	18	14			
Basmati	05	03	03	03			
Javanica	22	14	18	05			
Japonica	05	01	02	01			
Total	89	48	75	41			



Hybrid Rice Seed Production package

DESERVICEN	Activity	Particulars
C.	Seed Rate	Seed Parent : 20-25 kg/ha Pollen Parent : 8-10 kg/ha
and a second second	Nursery	Sparse seedling (30 g/m ²) to ensure multi tillered (4-5) seedlings in 25 days
Tor The Torth	Row ratio	2B : 8A for CMS multiplication 2R : 10 A for hybrid seed production
Py Sales	Number of seedlings/hi	2 seedlings/hill for seed parent 3 seedlings/hill for pollen parent
ARAN	Spacing	Male : Male – 30 cm; Male : Female – 20 cm Female : Female – 15 cm ; Plant : Plant – 15 cm
Hybrid seed production	GA ₃ Applicatio	45-60 g/ha in 500 lit of water at 5% heading in two split doses on consecutive days
additional employment of 65 person days/ha	Suppleme ntary pollination	Two-three times a day at peak anthesis during flowering phase
and most of them are women.	Roguing	Twice during vegetative phase based on morphological characters
	Seed yield	1.5-2.0 t/ha



	Hybrid Rice Seed Produced During 2007				
1.	By Private seed sector	18,000 tons Approx.			
2.	By public sector (NSC, APSSDC, KSSC, UPTDC, WBSC, etc.)	200 tons Approx.			
	Total	18,200 tons			

Public-Private Partnership MOUs with Private Seed Companies				
Hybrid	Developed by	MOU with no. of companies		
DRRH-2	DRR, Hyderabad	04		
Pusa RH-10	IARI, New Delhi	10		
PSD-1 & 3	GBPUAT, Pantnagar	01		
CORH-3	TNAU, Coimbatore	01		
Ajay & Rajalakshmi	CRRI, Cuttack	02		
KRH-2	UAS, Mandya	01		
Sahyadri-1	BSKKV, Karjat	01		
JRH-4, JRH-5	JNKV, Jabalpur	01		



Economics of hybrid rice seed production * The cost of seed production / hectare Rs. 40,000/- (U.S. \$ 970). * Procurement price Rs. 30 to 35 per kg (U.S. \$ 0.7 to 0.8).

- Net profit for seed growers per hectare Rs. 25,000 to 30,000 (U.S. \$ 625 to 750).
- Additional employment generation 80 person days / hectare, (for rural women)

Technology Transfer

Frontline Demonstrations

- ✤ 9000 in 16 states
- *****1.5 2.0 ton/ha yield advantage over HYVs.

Training

- ***** 400 programs organized.
- ✤ > 12000 personnel trained



Hybrid Rice Cultivation in different Regions of India Approximate area : 1.1 m. ha				
Region	Percentage			
Eastern UP, Bihar, Jharkhand and Chhattisgarh	80			
North-western and western Region	15			
Southern Region	5			

Major Challenges

- Meeting wide range of grain quality requirement
- Lack of availability of long duration hybrids for shallow lowlands and coastal areas.
- * Marginal heterosis which is still unattractive
- Lack of specific resistance to major pests & diseases.
- Higher seed cost

Future Research Strategies

- * Developing hybrids with acceptable grain quality
- Developing long duration hybrids for shallow lowlands and coastal areas.
- * Enhancing magnitude of heterosis
- Incorporating resistance to major pests and diseases.
- Refining seed production package to reduce seed cost
- Intensifying transfer of technology efforts

