Disease resistance in hybrid rice: An Experience from All India Coordinated Plant Pathology Program

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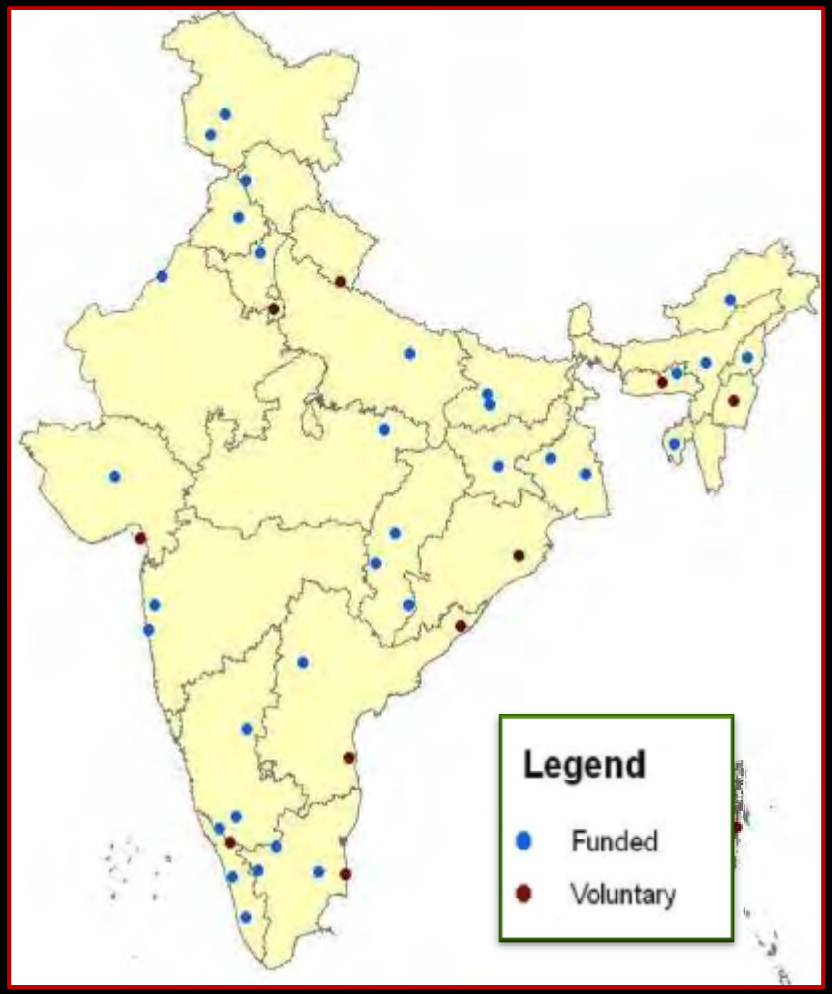
Disease scenario in India

Rice diseases induce losses to the tune of 15 to 20 % annually.

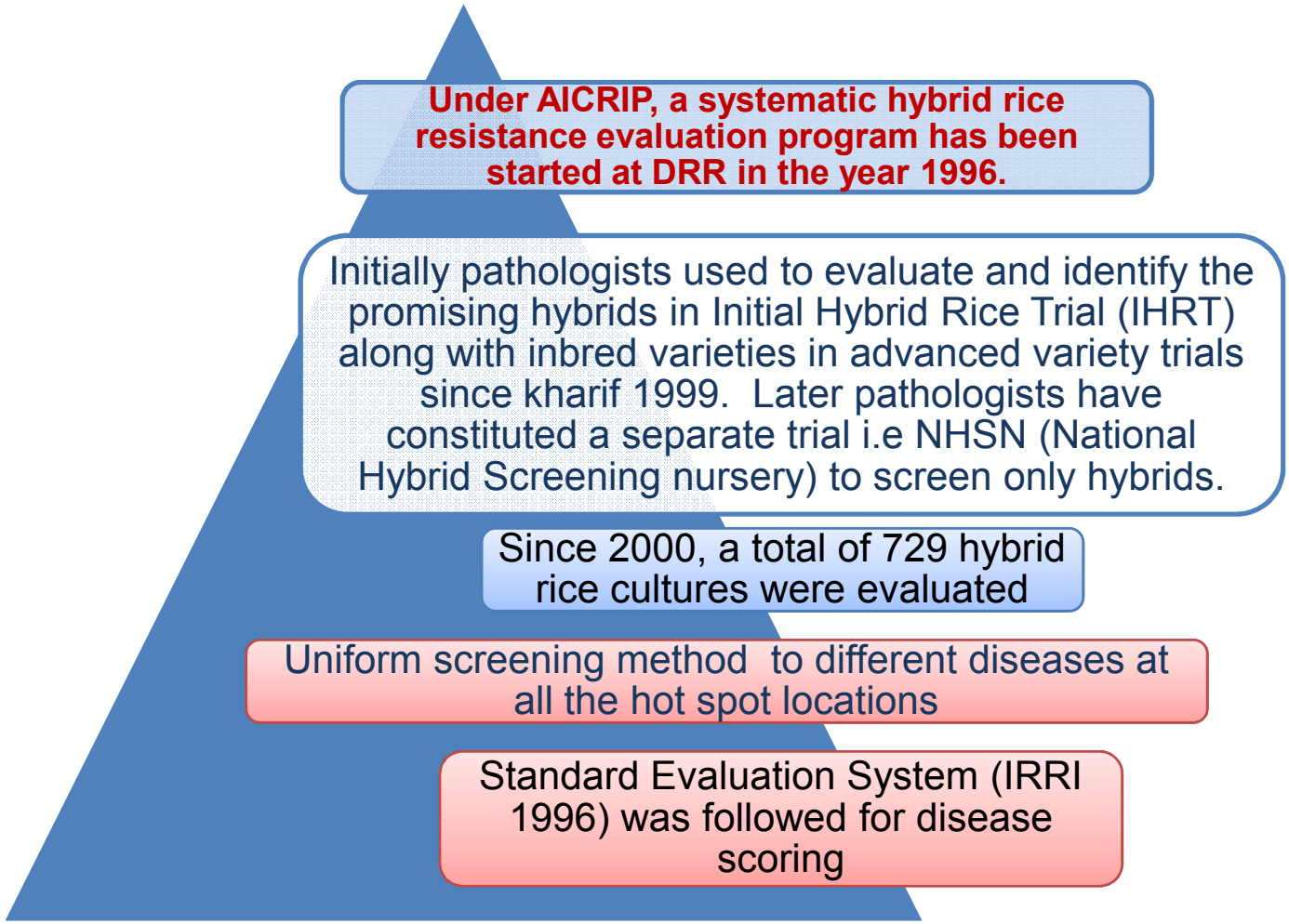
> 70 diseases have been reported on rice

- **Blast (*Pyricularia grisea*)**
- **Bacterial leaf blight (*Xanthomonas oryzae* pv. *oryzae*)**
- **Sheath blight (*Rhizoctonia solani*)**
- **Rice tungro (RTSV, RTBV)**
- **Sheath rot (*Sarocladium oryzae*, *F. moniliforme*)**
- **Brown spot (*Drechslera oryzae, Helminthosporium oryzae*)**
- **False smut (*Ustilaginoidea virens*)**
- **Foot rot & bakanae (*Fusarium moniliforme*)**
- **Stem rot (*Sclerotium oryzae*)**

AICRIP Plant Pathology



All India Co-ordinated rice pathology programme of DRR provides an effective linkage and testing mechanism to assess the advanced breeding lines over a wide range of climatic and disease epidemic conditions to identify broad spectrum of resistance to major rice diseases


Under AICRIP, a systematic hybrid rice resistance evaluation program has been started at DRR in the year 1996.
Initially pathologists used to evaluate and identify the promising hybrids in Initial Hybrid Rice Trial (IHRT) along with inbred varieties in advanced variety trials since kharif 1999. Later pathologists have constituted a separate trial i.e NHSN (National Hybrid Screening nursery) to screen only hybrids.
Since 2000, a total of 729 hybrid rice cultures were evaluated
Uniform screening method to different diseases at all the hot spot locations
Standard Evaluation System (IRRI 1996) was followed for disease scoring

Rice blast

- ***Magnaporthe grisea* (*Pyricularia grisea*)**
- **Yield loss - 70 – 80 % (Ou, 1985).**

Screening: **Uniform blast Nursery (UBN) Method**

S Check - HR 12
R Check- IR 64 and Rasi

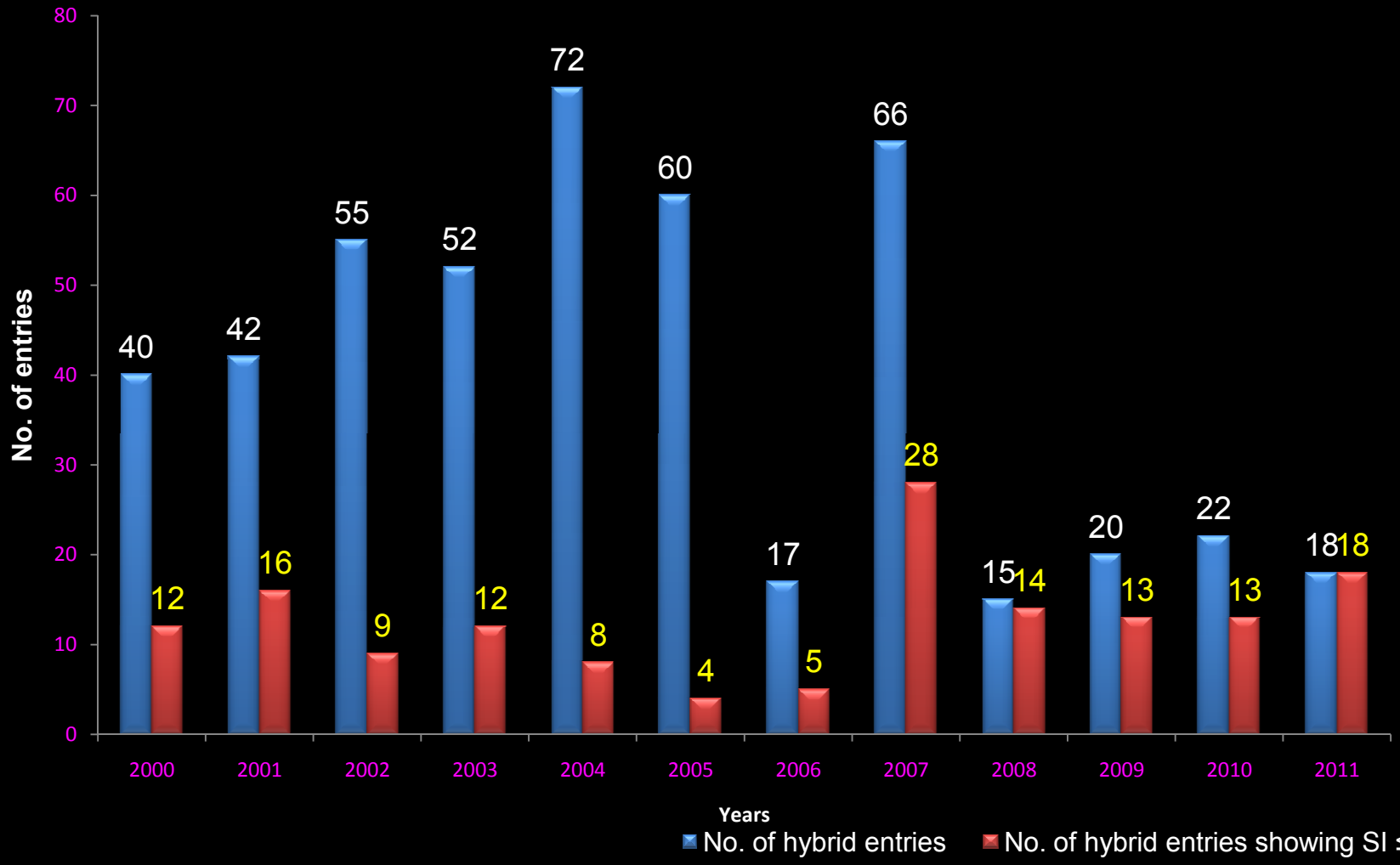
Hot spot locations of Blast (25)

Chiplima, Coimbatore, CRRI, DRR, Gangavathi, Gerua, Ghaghraghat, Gudalur, Hazaribagh, Jagadalpur, Karjat, Lonavala, Malan, Mandya, Maruteru, Mugad, Nawagam, Nellore, Pattambi, Ponnampet, Ranchi, Rewa, Umium, Varanasi and Wangbal

Year wise details of hybrid rice entries tested for Leaf blast

Parameters	Year of testing												
	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	AVR.
No. of hybrid entries	40	42	55	52	72	60	48	66	57	63	82	107	744
Total no. of locations	6	10	15	16	16	16	17	16	15	20	22	18	**6-22**
Disease pressure; LSI-Range (0-9 scale)	1.38-4.07	3.04-5.54	1.21-6.70	1.05-6.33	1.4-7.9	1.2-6.0	1.3-5.3	1.4-6.8	3.0-6.3	0.6-7.2	1.9-6.0	3.1-7.0	1.2-7.2
SI of S-check (HR-12)	6.0	6.43	6.5	6.5	6.5	6.5	5.9	5.1	6.5	7.1	6.2	7.4	6.0-7.4
SI of S-check (TN 1)	3.83	4.20	4.8	5.6	5.5	5.4	5.9	5.1	6.5	7.1	6.2	7.4	3.83-6.8
SI of R-check (IR 64)	1.67	3.80	3.67	3.1	3.6	2.7	4.6	5.3	5.7	5.9	5.3	6.8	**1.67-4.4**
SI of R-check (Rasi)	-	-	-	-	-	4.4	3.5	3.7	3.5	2.7	3.0	4.4	**3.6-5.6**
No. of hybrid entries showing SI ≤ 5	12	16	9	12	8	**4(61)**	5	28	14	13	13	18 **(91)**	**152**

Year wise details of hybrid rice entries tested for Leaf blast



Promising hybrid rice entries (SI ≤ 3) for blast

Year	Entries with SI ≤ 3	Details of promising entries (IET/Designation) Blast
2000	12	IHRT-E-2, IHRT-E-7, IHRT-E-8, IHRT-ME-1, IHRT-ME-2, IHRT-ME-3,IHRT-ME-4 ,IHRT-ME-11, IHRT-ME-12 ,IHRT-ME-13 IHRT-ME-17 IHRT-M-5 4
2001	16	IHRT-E-2, IHRT-ME-4 IHRT-ME-6 IHRT-ME- 8 IHRT-ME- 13 IHRT-ME-15 IHRT-M-1 IHRT-M-11
2002	9	IHRT-E-2 , IHRT-E-3 , IHRT-E-5 IHRT-E-7 IHRT-E-8 IHRT-E-9 IHRT-ME-10 IHRT-M-5 IHRT-M-6
2003	12	IET Nos.18136 , 18144, 18156, 18157, 18162, 18166, 18173, 18178, 18179, 18180, 18195
2004	8	IET Nos. 18862, 18858, 18829, 18816, 18859, 18834, 18815, 18827
2005	4	IET Nos. 19518, 19528 ,19529,18849
2006	5	IET Nos. 19738, 19746, 19749, 19754, 19755
2007	28	IET Nos. 20403, 20404, 20407, 20408, 20413, 20414, 20415, 20416, 20422, 20426, 20427, 20428, 20429, 20430, 20431, 20432, 20433, 20444, 20434, 20438, 20439, 20440, 20441, 20442, 20446, 20447, 20453, 20456
2008	14	IET Nos. 20715, 20721, 20726, 20756, 20736, 20738, 20716, 20720, 20722, 20723, 20730, 20709, 20710, 20459
2009	13	IET Nos. 21431, 21415, 21405, 21408, 21427, 21401, 21404, 21429, 21407, 21422, 21403, 21444, 21432
2010	13	IET Nos. 21807, 21806, 21787, 21801, 21810, 21770, 21774, 21800, 20755, 21829, 21812, 21771, 21783
2011	18	22345, 22346, 22370, 22371, 22376, 22394, 22399, 22384, 21826, 22352, 22362, 22363, 22364, 22369, 22374, 22326, 22383, 22400

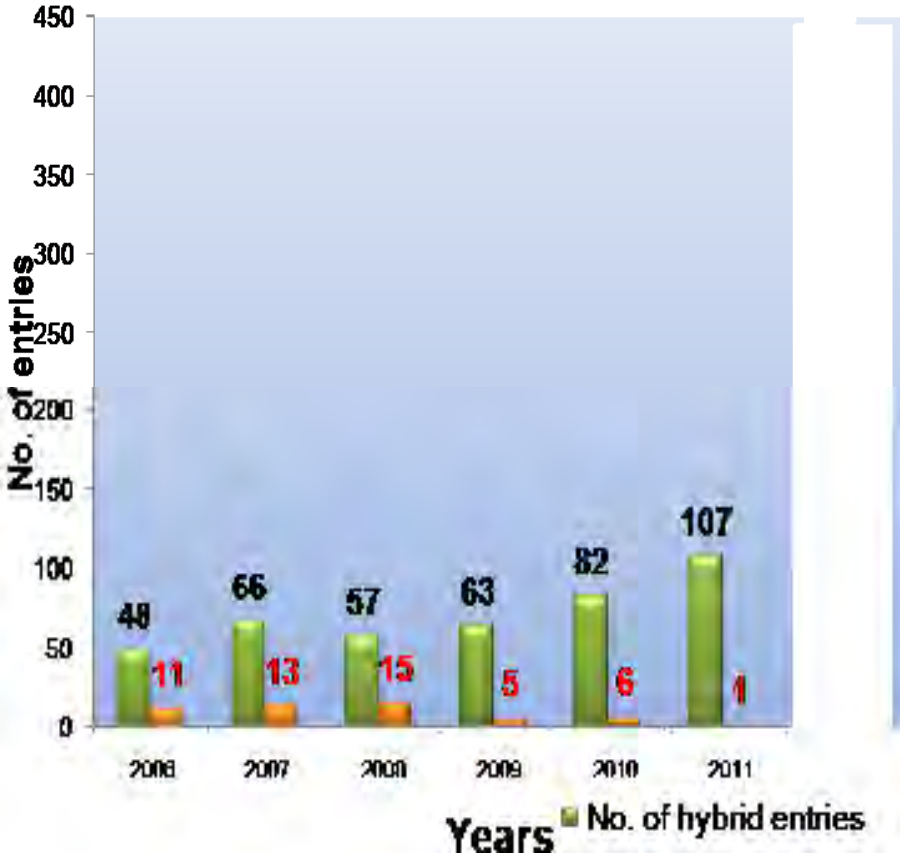
Neck blast

- causes yield loss of 5-6%

Parameters	Year of testing						
	2006	2007	2008	2009	2010	2011	(2006-11)
No. of hybrid entries	48	66	57	63	82	107	423
Total no. of locations	3	2	2	7	6	2	2-7
Disease pressure; LSI-Range (0-9 scale)	3.6-5.5	4.7-5.2	3.0-5.5	1.1-7.7	1.4-7.7	4.8-7.6	1.1-7.7
SI of S-check (HR-12)	5.0	8.0	9.0	4.8	4.0	7.0	4.0-9.0
SI of S-check (TN 1)	7.7	9.0	7.0	3.7	3.8	7.0	3.7-9.0
SI of R-check (IR 64)	7.0	7.0	5.0	3.6	2.0	6.0	2.0-7.0
SI of R-check (Rasi)	7.0	5.0	7.0	3.2	2.3	7.0	2.3-7.0
No. of hybrid entries showing SI ≤ 5	11	13	15	5	6	1	51

Hot spot locations (19): Chiplima, CRRI, Gerua, Ghagharaghat, Gudalur, Hazaribagh, Jagadalpur,
Karjat, Lonavala, Malan, Mugad, Nawagam, Nellore, Pattambi, Ponnampet, Ranchi, Rewa, Umium, Wangbal

Hybrid rice entries tested for Neck blast in AICRIP



Year	Entries SI ≤ 3	Details of promising entries (IET/Designation)
2006	11	IETNos.19754,19530, 19735, 19737, 19741, 19755, 19757, 19760, 19763, 19542, 19767
2007	13	IET Nos. 20447, 20403, 20429, 20446, 20457, 20413, 20422, 20426, 20453 20434 , 20443, 20448, 20455
2008	15	IET Nos. 20749 ,20715 ,20716, 20741, 20460, 20750, 20751, 20711, 20752, 19766, 20756, 20744, 20717, 20720, 20724
2009	5	IET Nos. 21415 ,21434, 20752, 20758, 20460
2010	6	IET Nos. 20755, 21771, 21777, 21784, 21817, 21819
2011	1	IET No. 22353

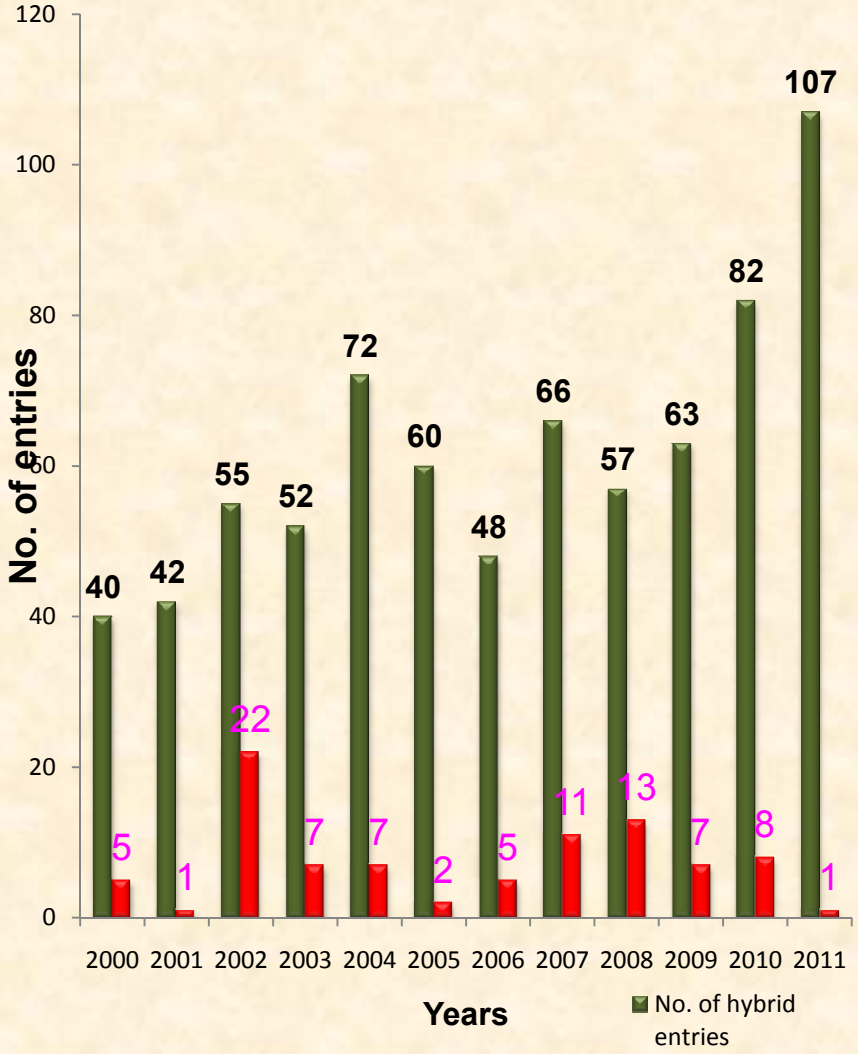
Sheath blight - *Rhizoctonia solani*

- **Yield loss - 20 to 50%**
- **Screening method : Typha bit / corn or rice culm bits**

Parameters	Year of testing												
	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	AVR.
No. of hybrid entries	40	42	55	52	72	60	48	66	57	63	82	107	744
Total no. of locations	4	7	7	7	9	11	14	13	12	12	15	12	4-15
Disease pressure; LSI-Range (0-9 scale)	5.5-7.98	4.4 - 8.18	2.4-7.7	2.92-8.00	4.2-6.9	0.6-8.9	1.8-7.3	1.8-7.0	4.3-8.3	2.7-8.9	4.3-8.5	4.8-8.3	0.6-8.18
SI of S-check (TN 1)	8.50	7.43	5.5	6.43	7.0	6.1	6.7	5.7	6.7	6.7	6.1	7.5	5.5-8.50
SI of R-check (Swarnadhan)	4.75	5.86	3.8	5.57	5.7	5.8	5.4	5.1	5.6	5.2	4.6	5.7	3.8-5.86
			22	7	7	2	5	11	13	7	8	1	89

Hot spot locations(19): Aduthurai, Arundhutinagar, Bankura, Chatha, Chinsurah, CRRI, DRR, Faizabad, Gangavathi, Gerua, Ludhiana, Mandya, Maruteru, Moncompu,Pantnagar,Pattambi, Port Blair, Raipur, Titabar

Promising hybrid rice entries for Sheath blight



Year	Entries SI ≤ 5	Details of promising entries (IET/Designation)
2000	5	IHRT-E-1,IHRT-ME-11,IHRT-M-10, IHRT-M-11, IHRT-M-12
2001	1	IHRT-ME-12, IHRT-M- 1, IHRT-M- 9, IHRT-M- 2, IHRT-M- 5
2002	22	IHRT-E-5 to IHRT-E-7, IHRT-E-9,to IHRT-E-11, IHRT-ME-2 to IHRT-ME-4, IHRT-ME-6, IHRT-ME-9 to IIHRT-ME-11, IHRT-ME-15, IHRT-ME-16, IHRT-ME-20, IHRT-ME-21, IHRT-M-1, IHRT-M-5, IHRT-M-7, IHRT-M-9, IHRT-M-16
2003	7	IET Nos.18149, 18160,18281,18169,18173,18178, 18283
2004	7	IET Nos. 18873, 18875, 18866, 18876, 18834, 18870, 18867
2005	2	IET Nos. 19539, 18849
2006	5	IET Nos. 19744 ,19746, 19750, 19752, 19753
2007	11	IET Nos.20450 ,20444, 20451, 20447, 20457, 20433, 20442, 20448, 20452, 20453, 20439
2008	13	IET Nos.20756, 20740,20721,20733 ,20459, 20757,20758,20759 20746, 20722, 20729 ,20749, 20750
2009	7	IET Nos. 21441, 21449, 21442, 21434, 21402, 21432, 21433
2010	8	IET Nos. 21782, 21808, 21811, 21807, 21820, 20759, 21804, 21832
2011	1	IET No.22400

Sheath Rot - *Sarocladium oryzae*

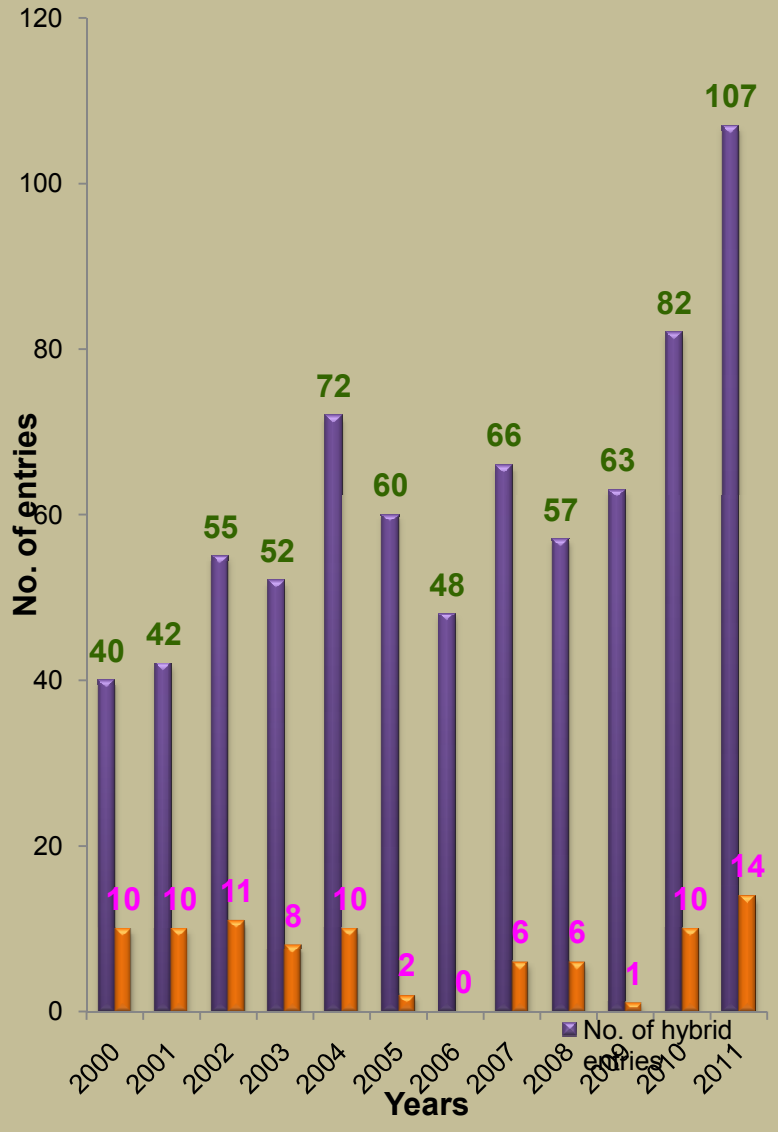
➢ **Yield loss – up to 50%**

AI : Multiply pathogen on autoclaved rice grains. Spray spore suspension at booting stage

Parameters	Year of testing												
	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	AVR.
No. of hybrid entries	40	42	55	52	72	60	48	66	57	63	82	107	744
Total no. of locations	2	4	5	7	7	6	9	9	8	9	10	7	2-10
Disease pressure; LSI-Range (0-9 scale)	2.9-7.2	1.3-6.70	1.5-6.3	1.33-7.22	1.0-7.8	2.0-8.1	1.7-8.3	1.0-7.6	1.7-8.0	2.6-9.0	2.3-7.7	3.9-7.9	1.0-8.3
SI of S-check (TN 1)	7.0	7.0	4.8	3.57	5.7	5.3	6.6	5.1	5.8	5.4	5.9	4.6	6.6-5.1
Hybrid entries showing SI≤5	10	10	11	8	10	2	-	6	6	1	10	14	88

Hot spot locations(17): Aduthurai, Bankura, Chatha, Chinsurah, Lonavala, Mandya, Maruteru, Moncompu, Nawagam, Nellore, Patna, Pantnagar, Puducherry, Pusa, Ragolu, Raipur, Rajendranagar

Hybrid rice entries tested for Sheath rot in AICRIP



Year	Entries SI ≤ 5	Details of promising entries (IET/Designation)
2000	10	IHRT-E-6, IHRT-E-7, IHRT-ME- 3, IHRT-ME- 9, IHRT-M-7, IHRT-M-8, IHRT-M-9, IHRT-M-11 ,IHRT-M-12, IHRT-M-13
2001	10	IHRT-E-1, IHRT-E-3, IHRT-ME-12 IHRT-ME- 13 IHRT-M- 3, IHRT-M-4, IHRT-M-6, IHRT-M-10, IHRT-M-12, IHRT-M-14
2002	11	IHRT-M-14, IHRT-ME-1, IHRT-ME-9, IHRT-ME-13, IHRT-M-18, IHRT-M-13, IHRT-M-12, IHRT-M-15, IHRT-E-5, IHRT-E-8, KRH-2
2003	8	IET Nos.18147, 18282, 18165, 18172, 18174, 18177, 18179, 18195
2004	10	IET Nos.18865, 18808, 18834, 18810, 18825, 18876, 18855, 18805, 18853, 18877,
2005	2	IET Nos.19494, 19535
2006	Nil	
2007	6	20417, 20421, 20457, 20460, 20453, 19766
2008	6	20723, 20722, 20721, 20733, 20728, 20745
2009	1	21398
2010	10	21816, 21793, 21811, 21821, 21832, 21817, 21800, 21801, 21812, 21827
2011	14	22394, 21827, 22382, 22364, 22343, 22373, 22381, 22366, 22400, 22370, 22359, 22387, 22385, 22365

Brown spot

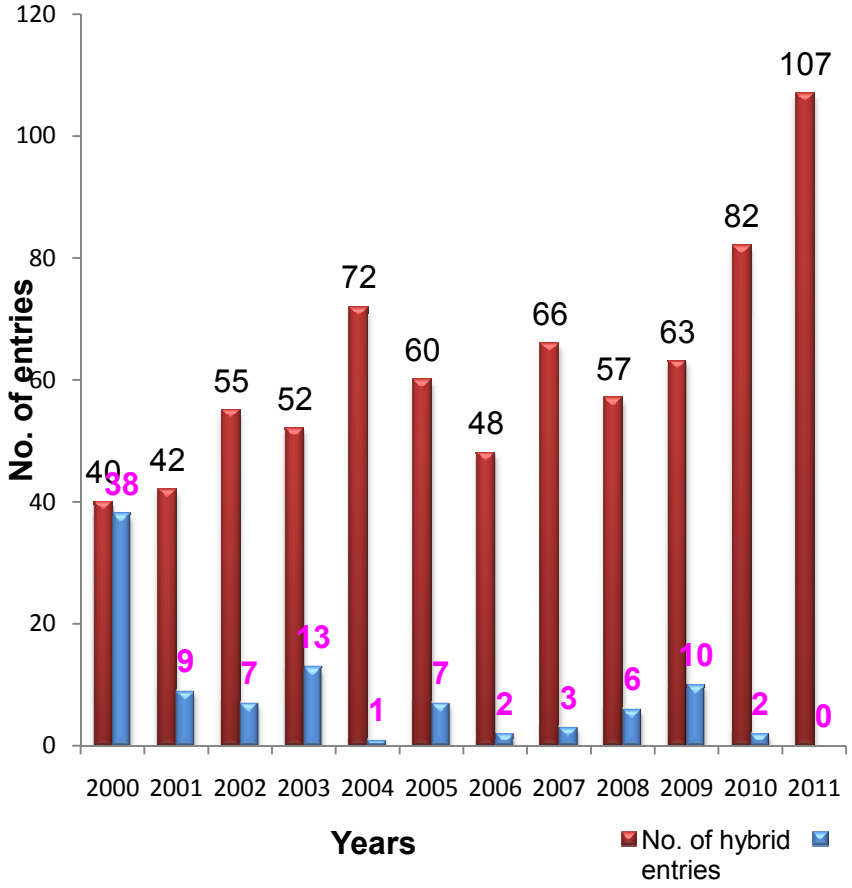
Helminthosporium oryzae

Parameters	Year of testing												
	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	Avr.
No. of hybrid entries	40	42	55	52	72	60	48	66	57	63	82	107	744
Total no. of locations	4	4	5	7	11	10	11	12	11	13	15	10	4-15
Disease pressure; LSI-Range (0-9 scale)	1.40-4.00	1.9 -6.2	4.5-6.4	1.9-4.6	2.4-7.0	2-6	2.8-7.2	2.9-6.9	3.5-7.2	3.2-6.4	1.6-6.8	3.9-8.2	1.6-8.2
SI of S-check (TN 1)	2.50	3.25	4.80	2.6	3.9	2.9	4.5	4.6	4.9	3.9	5.5	3.9	2.6-5.5
hybrid entries showingSI≤5	38	9	7	13	1	7	2	3	6	10	2	-	98

Hot spot locations (18) :

Arundhutinagar, Chatha, Ghagharaghat, Gudalur, Hazaribag, Jagadalpur, Lonavala, Ludhiana , Mandya, Moncompu, Nellore, Ponnampet, Pusa, UpperShillong, Rewa, Umium, Varanasi

Hybrid rice entries tested for brown spot in AICRIP



Year	Entries SI ≤ 5	Details of promising entries (IET/Designation)
2000	38	IHRT-E-1 to 9, IHRT-ME-1 to 17, IHRT-M-1 to 7, IHRT-M-10, IHRT-M-11, IHRT-M-12 to 14
2001	9	IHRT-E-8, IHRT-E-10, IHRT-ME-1, IHRT-ME-2, IHRT-ME-4, IHRT-ME-6, IHRT-ME-7, IHRT-ME-8, IHRT-ME-13
2002	7	IHRT-E-2, IHRT-E-5, IHRT-E-7,IHRT-E-8, IHRT-E-9, IHRT-M-5, IHRT-M-6
2003	13	IET Nos. 18133 ,18135, 18136, 18145, 18147, 18156 ,18161, 18163 ,18282, 18164 ,18174 ,18179, 18180
2004	1	IET No. 18808
2005	7	IET Nos. 19494, 19498, 19500 , 19533, 18852 ,19540 ,19541
2006	2	IET Nos. 19767 ,19739
2007	3	IET Nos. 20407, 20403, 20453
2008	6	IET Nos. 20722, 20746, 19763, 20737, 20744, 20725
2009	10	IET Nos. 20752, 21395, 21430, 21440, 21443, 21412, 21438 , 21441, 21399, 21427
2010	2	IET Nos. 21771, 21772
2011	14	US-344, Pusa RH-41, CRHR-33 ,NK 9422, TNRH-241 XRA 07928, Signet-5051 05-383, CHRH-36, BISCO-407, KSL 210011H , JKRH-2044, VNR-2377

False smut *Ustilaginoidea virens* (POS, 2005 -10)

- **Yield losses between 0.2% and 49%**

Name of the State	Name of the District	Year	Name of the hybrid/variety	Severity of the False smut
Haryana	Jind	2005	PHB-71 (H)	M
	Panipat	2005	PA-6444-(H), Khusbu-(H)	M-S
	Hissar	2005	PA-6444 (H)	S
	Kurukshetra	2009	PA-6129 (H), RH-257 (H)	S
	Yamuna Nagar	2009	RH-257 (H), PA-6444 (H) Hybrid-748 (H), Sugandha-999(H)	S
	Yamuna Nagar	2010	PA-6444 (H)	S (55-60%)
	Kurukshetra	2010	Sagar Hybrids (H)	L-M
	Ambala	2010	PA-6444 (H)	S (60-65%)
	Panipat	2010	PA-6129 (H)	S (85-90%)
H P	Sirmaur	2005	Hybrid -71 (H), Sayadri (H)	S
Jharkand	Ramgarh	2007	PHB-71-(H), Sayadri (H), Ankurdhan-(H)	L
	Tamkur	2010	Arize-Hybrid (H)	M
UP	Dehradun	2007	NDR-359-(I)	L-M

Bacterial leaf blight *Xanthomonas oryzae* pv. *oryzae*

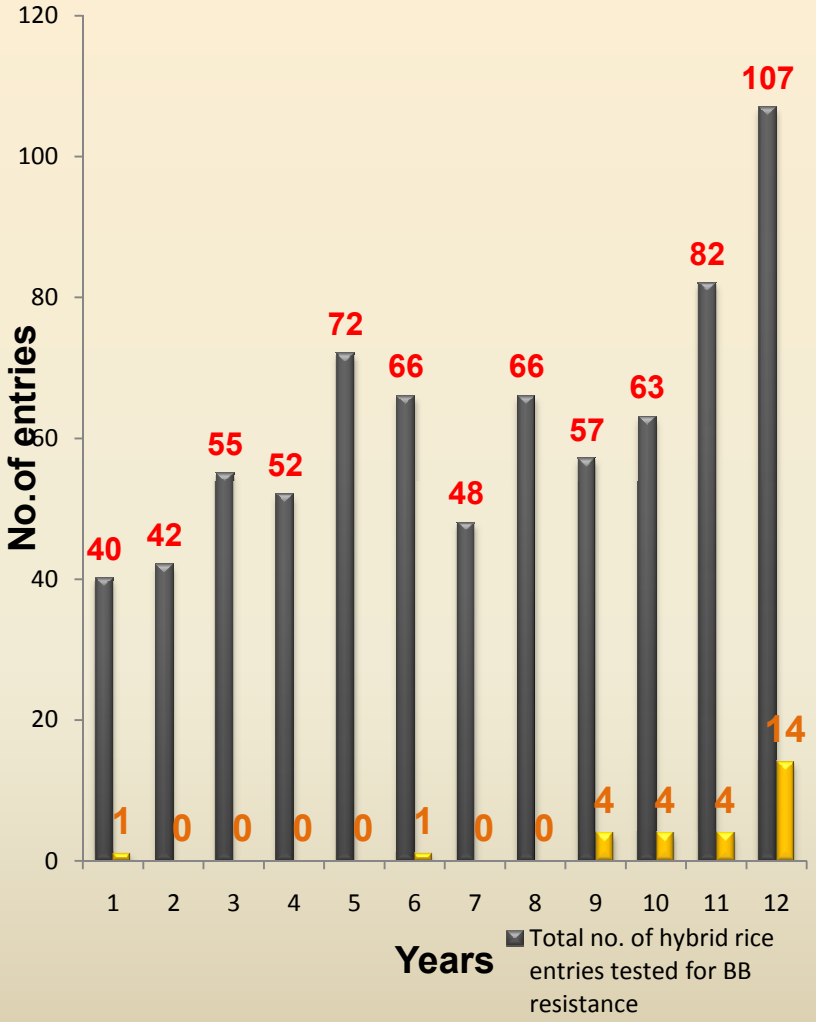
- **AI : A leaf clipping method developed at AICRIP**
- **leaves (50-55 days old plants) are cut with scissor dipped in bacterial suspension**

Hot spots locations: **Aduthurai, Arundhutinagar, Chinsurah, Chiplima, CRRI, DRR, Faizabad,Gangavathi, Karaikal, Karjat, Kaul, Ludhiana, Maruteru, Navasari, Nawagam, Nellore, Patna, Pantnagar, Pattambi, Raipur, Titabar**

Year wise details of hybrid rice entries tested for bacterial blight in AICRIP

Parameter	Year of testing													
	2000	2001	2002	2003	2004	2005	(2000-06)	2006	2007	2008	2009	2010	2011	(2006-11)
No. of hybrid entries	40	42	55	52	72	66	327	48	66	57	63	82	107	**423**
Total no. of locations	3	9	8	7	13	15	3-15	16	15	16	14	18	16	**14-18**
Disease pressure; LSI-Range (0-9 scale)	6.57-6.66	5.68-8.22	4.42-8.7	7.06-9.0	3.9-8.6	5.0-8.7	3.9-9.0	3.4-8	4.1-8.8	3.0-8.1	4.25-8.4	3.2-8.3	3.1-7.9	**3.0-8.8**
SI of S-check (TN 1)	6.61	6.71	8.04	7.88	7.03	6.22	7.08	7.7	7.7	7.4	7.4	7.8	6.9	**6.9-7.8**
SI of R-check (Swarnadhan)	8.0	8.78	9.0	8.14	8.3	8.3	8.0-9.0	4.9	4.4	4.6	4.6	4.3	4.9	**4.3-4.9**
No. of hybrid entries showing 4≤SI≤5	4.67	4.33	5.0	6.71	5.2	4.7	4.33-6.71	-	-	-	3.6	-	3.2	**3.2-3.6**
	1	0	0	0	0	1	2	0	0	4	4	4	14	**26**

Hybrid rice entries tested for bacterial blight



Year	Entries SI ≤ 5	Details of promising entries (IET/Designation)
2000	1	IHRT-ME-15
2001	0	-
2002	0	-
2003	0	-
2004	0	-
2005	1	IET # 19504/NK 7125
2006	0	-
2007	0	-
2008	4	IET # 20713, 20754, 20722, 20723
2009	4	IET # 21423 (VNR-203), 21443 (CRHR-48), 21414 (IRH-52), 21400 (US-310)
2010	4	IET # 21447, 21780, 21829, 21826
2011	14	IET # 22362 (HRI-176), 22379 (HRI-174), 22323 (HRI-175), 22380 (HRI-177), 21826 (US-303), 22391 (MTUHR-2096), 22381 (HRI-178), 22395 (CRHR-36), 22396 (US-341), 22397 (US-344), 22394 (CRHR-33), 22401 (PAN-812), 22343 (RH-9009), 22384 (KPH-382)

Rice tungro virus disease

- Inoculate entries 20 days after planting.
- Release 2 to 3 viruliferous leafhoppers per hill, cage it for 24 hrs

Parameters	Year of testing												
	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	AVR.
No. of hybrid entries	40	42	55	52	72	60	48	66	57	63	82	107	744
Total no. of locations	2	1	2	3	3	4	5	5	4	3	4	4	1-5
Disease pressure; LSI-Range (0-9 scale)	3.34-5.17	4.1-4.0	1.2-5.7	2.7-5.0	3.0-6.1	2.0-5.9	1.5-6.9	4.1-6.3	3.8-6.7	5.7-6.5	4.5-6.9	3.2-7.7	1.2-6.9
SI of S-check (TN 1)	5.00	3.0	5.0	5.67	7.0	5.3	5.4	7.0	7.0	7.7	7.5	7.7	3.0-7.7
SI of R check-1(Vikramarya)	5.00	5.0	2.0	3.67	3.0	3.3	3.8	4.0	5.0	5.0	4.3	4.5	2.0-5.0
hybrid entries showing SI≤5	6	14	27	8	7	7	1	3	11	Nil	8	Nil	92

Rice hybrids showing multiple disease resistance

S.NO	**Hybrid**	**BL**	**BLB**	**RTV**	**ShBL**
1	APHR-1		MR		
2	APHR-2		MR		
3	(MGR-1) CORH-1			R	
4	KRH-1				
5	CNRH-3				
6	**DRRH-1**	**R**			
7	**KRH-2**	**R**			
8	Pant Sankar Dhan -1	MR	MR	MR	
9	**PHB 71**	**T**	**T**		
10	CORH-2	MR		MR	
11	ADTRH-1				
12	Sahyadri	MR			
13	Narendra Sankar Dhan-2	R	R		
14	**PA 6201**	MR		MR	
15	**PA 6444**	MR		MR	
16	**Pusa RH-10**		MR	MR	

S.No	Hybrid	Blast	BLB	Tungro	Sheath blight
17	**PRH-122(Ganga)**	R			
18	**RH-204**	R			
19	**Suruchi**	R			
20	Pant Sankar Dhan-3	MR	MR	MR	
21	Narendra Usar Sankar Dhan-3		R		MR
22	**DRRH-2**	R		R	
23	**Rajalakshmi**	MR	MR		
24	Ajay	MR	MR		
25	**Sahyadri-2**	**MR**	**R**	**MR**	
26	Sahyadri-3	R	MR		MR
27	HKRH-1	R			
28	**JKRH-401**	MR		MR	MR
29	**CORH-3**	**T**		**T**	
30	Indira Sona	MR	MR		
31	JRH-4	R			
32	JRH-5	R			
33	**PA 6129**	R			
34	**GK 5003**	R		R	MR

S. No	Hybrid	Blast	BLB	Tungro	Sheath blight
35	Sahyadri- 4	MR		MR	
36	JRH-8				
37	DRH 775	MR		MR	
38	HRI-157			MR	
39	PAC 835	R	MR	MR	
40	PAC 837	R		MR	
41	DRRH-3	MR		MR	
42	US 312	R		MR	
43	Indam 200-017	MR			
44	CRHR-32			MR	MR
45	NK 5251				
46	27P11	R			MR
47	VNR202	MR	MR	MS	MR
48	VNR204		MS	MR	MS
49	TNAU Rice Hybrid C0-4				
50	Sahyadri-5				
51	US382	R	MR	MR	MR
52	27P31	MR	MR	MR	MS
53	HRI169	R	MS	MR	MS
54	RH1531	R			
55	PNPH21	T			
56	25P25	MR	MS	MR	MS
57	27P61	MR			
58	JKRH3333			T	

Conclusions

- Though many options for the management of the plant diseases such as physical, cultural, biological and chemical methods; host plant resistance stood at top most priority as it is eco friendly and cost effective.

- Of late use of multiple disease resistance hybrids is the major strategy to combat two or more diseases simultaneously.

- Under AICRIP programme, screening methods for all the major rice diseases are well developed. More attention is required to develop isolation and inoculation procedures for emerging diseases like false smut, bakanae and leaf scald.

- The use of molecular markers in introgression and pyramiding resistance genes for both blast and BLB has become an advantage to enhance the accuracy in the development of multiple disease resistant hybrids.


Thank You