

Identification of Suitable Hybrid Rice Varieties Under Irrigated Transplanted Condition of Parwanipur

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Abstract: A field experiment was conducted at the Regional Agricultural Research Station, Parwanipur, Bara, Nepal during summer seasons of 2011 and 2012 to identify the high yielding early to medium maturity hybrid rice varieties under irrigated transplanted condition. The experiment was conducted in RCB design having three replications. Two sets of experiment during both year were conducted and the result revealed that Indam 20017 (6409 kg ha⁻¹) and Ford 140 (5849 kg ha⁻¹) produced highest grain yield during 2011 while Rashi 111 (5795 kg ha⁻¹) and DRH 748 (5556 kg ha⁻¹) produced the highest grain yield during 2012.

Keywords: hybrid rice, varieties, irrigated, grain yield

1. Introduction

Rice is the major cereal crop and staple food of Nepal. More than 50% of the calorie intake by Nepalese population comes from rice. Rice ranks the first on the basis of area (1.53 million ha) and production (5.07 million ton) with the productivity of 3.31 t ha⁻¹ (MOAC, 2012) which is very low as compared to other countries. It is anticipated that our population will be 30.5 million by 2020 A.D. Long term agriculture perspective plan has envisaged that rice production must increase to 6 million tons from current production by 2020 to feed the growing population. So that it is very important to increase the production rate. The cultivation of conventional varieties alone cannot meet the demand and there is no more land to bring under rice cultivation. To meet this challenge, research to increase rice productivity must receive high priority. Among the many approaches, hybrid rice technology appears to be most feasible and readily adoptable one to give support in food security. Hybrid rice can contribute significantly to increasing rice production, especially in irrigated condition. It has a yield advantage of more than 30% over conventional pure line varieties (Yuan, 1994). Hybrid rice technology has helped to increase yield potential in rice by 15-20% (1-1.5 t ha⁻¹) beyond the yield of semi-dwarf inbred high-yielding varieties by exploiting the phenomenon of hybrid vigor. This technology has had a tremendous impact on achieving food security, increasing farmers' income and protecting the environment in China where rice hybrids yielding on average 7.0 t ha⁻¹ (IRRI, 2005). Now, in Nepal, farmers are accepting hybrid rice varieties from China and India and it is becoming popular. Farmers are widely cultivating these hybrid varieties and the area and demand is also increasing. Therefore, using of hybrid rice has tremendous scope of higher rice production as well as increasing livelihood and ensuring food security. So, it is necessary to evaluate and recommend to farmers those hybrid varieties having higher yield potential.

2. Material and Methods.

The experiment was conducted during the summer season of 2011 and 2012 at Regional Agricultural Research Station, Parwanipur, Bara, Nepal situated in central terai region at altitude of 120 meter above mean sea level with 27°2' North latitude and 84°53' East longitude. The soil of the experimental plot was loam in texture. The area has a subtropical type of climate highly influenced by southwestern monsoon. Out of the total annual rainfall of 2040.9 mm during 2011 and 799.1 mm during 2012, 1766.9 mm and 681.6 mm were received in the rice growing period respectively in 2011 and 2012 (from June to November). The experiment was laid out in Randomized Complete Block Design (RCBD) with three replications. Nitrogen, phosphorus and potassium were applied @ 140:60:30 kg ha⁻¹. Full dose of phosphorus and potash were applied as basal dose at sowing while nitrogen was applied as half as basal and remaining half with two splits – one half at active tillering stage and remaining half at panicle initiation stage. Plot size was 15 m² and plant spacing was 20 cm x 20 cm. All the collected data were subjected to analysis of variance from the reference of Gomez and Gomez (1984) and M-STAT software was used for statistical analysis.

3. RESULT AND DISCUSSION:

There were two sets of experiment each in 2011 and 2012. During 2011, in first set, 36 rice varieties were tested. Among them, 34 varieties were Indian Hybrid and 2 varieties (Hardinath-1 and Sabitri) were popular inbred varieties which were used as standard check and among the tested entries the top grain yield was produced by Indam 20017 (6409 kg ha⁻¹) followed by US-316 (5884 kg ha⁻¹) and Hybrid Pri (5872 kg ha⁻¹).

Table 1: Yield and ancillary characters of selected rice genotypes in Hybrid rice (set 1) conducted at Parwanipur, Bara, Nepal during 2011.

E N	Designation	Days to flowering	Days to maturity	Plant ht. (cm)	Panicle length (cm)	No. of tiller m ⁻²	1000- grain wt. (gm)	Sterility %	Grain yield (kg ha ⁻¹)
1	Samrat	95	127	101.6	26.40	269.0	24.26	21.88	5020
2	Ashwarya	91	124	101.8	25.07	277.7	25.61	15.75	4474
3	Shanti	94	127	107.2	26.60	232.7	24.91	17.54	5317
4	Indam 20017	91	129	120.1	27.20	223.0	27.23	14.02	6409
5	US-315	84	119	103.1	25.60	212.7	22.61	17.55	3198
6	Dalta Rani	96	127	96.20	23.73	202.3	17.09	12.26	4026
7	US-32	88	127	109.7	27.13	228.3	24.16	18.40	4908
8	Sudha	96	129	108.7	25.80	247.0	25.76	15.32	5770
9	US-316	91	128	109.9	25.80	238.0	22.00	10.66	5884
10	US-382	88	123	111.3	25.73	177.0	25.11	19.49	5281
11	NPH-909	89	128	108.1	25.93	252.7	22.23	11.69	4687
12	NPH-567	96	128	107.9	25.67	244.7	24.66	14.87	5719
13	NPH-8899	99	129	104.7	24.13	211.3	17.83	15.10	4799
14	NP-124-8	86	129	103.3	22.27	233.3	16.99	22.61	3870
15	NP-360 Moti GO	106	131	100.0	24.20	228.7	19.99	21.87	4279
16	NP-950 Sahare	100	131	104.3	25.60	316.0	22.26	25.08	4782
17	Super Moti	95	126	95.80	23.40	222.0	16.97	7.90	3992
18	NP-1024 Moti Go	102	127	101.5	23.73	255.3	16.38	18.83	4078
19	GK-5017	93	127	109.3	25.60	234.3	25.28	12.66	5429
20	GK-50023	89	126	109.2	25.13	193.7	23.22	16.14	5396
21	MTU 7029	108	138	85.27	21.93	268.0	19.67	29.61	4385
22	GK-46	106	136	106.2	26.20	216.3	19.74	27.88	3514
23	Kailash	94	127	108.4	25.40	266.7	25.05	15.11	5343
24	Aakash	90	126	112.1	26.47	260.7	21.49	12.81	5589
25	Sagar	96	134	104.1	24.60	266.0	23.59	16.82	5086
26	Srijana	105	133	84.2	19.93	288.3	15.04	16.84	3790
27	Sundar	96	127	92.8	24.40	230.3	17.00	11.33	4185
28	Sandar	96	127	94.87	22.13	239.0	17.21	16.34	4385
29	Sindoor	104	131	93.73	23.13	251.3	14.79	19.95	3307
30	Dhani	106	137	111.3	26.27	243.7	23.59	24.41	5297
31	6129 Bulk	87	124	99.80	23.33	227.3	24.91	14.17	5305
32	Tej Paddy	92	124	106.8	25.47	234.7	24.67	18.82	5739
33	6444 Gold	96	127	103.3	23.40	208.0	25.27	14.60	5288
34	Hybrid Pri	95	127	109.8	25.47	224.3	26.00	19.74	5872
35	Hardinath-1	76	112	102.3	23.87	250.3	19.32	63.30	1365
36	Sabitri	109	140	101.4	25.13	266.3	20.80	31.51	3420
	F-test	**	**	**	**	**	**	**	**
	Grand mean	95.5	128.3	103.6	24.7	240.0	21.7	18.9	4699
	LSD at (0.05)	2.8	1.4	8.8	2.4	50.7	2.7	10.4	1172
	CV %	1.8	0.7	5.2	6.0	13.0	7.7	34.1	15.4

In case of set two, 24 varieties were tested and among them 20 were Indian hybrid and 4 (Hardinath-1, Sabitri, Swarna sub-1 and Radha-12) were inbred varieties used as standard check

(Table 2) and among the tested entries the top grain yield was produced by Ford 140 (5849 kg ha⁻¹) followed by RH 1531 (5548 kg ha⁻¹) and Loknath 510 (5190 kg ha⁻¹). (0.14").

Table 2: Yield and ancillary characters of selected rice genotypes in Hybrid rice (set 2) conducted at Parwanipur, Bara, Nepal during 2011.

E N	Designation	Days to flowering	Days to maturity	Plant ht. (cm)	Panicle length (cm)	No. of tiller m ²	1000- grain wt. (gm)	Sterili ty %	Grain yield (kg ha ⁻¹)
1	RH 664	95	129	105.4	26.0	233.7	20.95	12.72	4870
2	RH 1531	94	129	111.7	25.8	241.7	26.75	17.59	5548
3	RH 9000	96	130	115.4	27.8	243.3	22.99	11.09	5187
4	RH 1422	106	129	107.3	24.8	233.3	25.45	15.69	4516
5	RH 9009	98	132	104.6	27.4	224.3	22.79	13.26	4938
6	RH 122 Ganga	92	129	95.8	24.6	247.3	26.12	19.05	4398
7	Kabir 508	89	128	97.3	25.6	298.0	25.08	29.77	4229
8	Loknath 510	103	134	110.7	28.9	257.7	29.72	22.34	5190
9	Ford 140	99	134	107.6	27.0	251.0	23.48	16.54	5849
10	Karina	99	130	91.8	26.1	246.3	16.01	13.72	3554
11	Menka	96	130	111.9	27.4	228.7	37.20	14.44	3599
12	27P31	99	131	110.9	26.0	265.3	28.31	13.17	4493
13	27P52	105	134	109.1	26.0	277.3	24.68	27.75	4283
14	25P25	91	129	105.7	27.5	308.0	25.94	25.70	4990
15	Bio 777	93	130	104.3	25.8	252.3	23.85	24.73	5012
16	Bio 795	99	134	112.9	26.2	246.7	22.38	23.20	4476
17	BH 21	95	132	103.3	28.4	280.0	26.82	18.21	4812
18	Bio 501	113	137	96.5	22.8	302.3	16.01	24.55	3683
19	Bio 301	112	137	85.2	23.9	345.7	15.17	23.87	3283
20	Adara	94	131	105.5	23.6	269.7	27.07	25.22	4412
21	Swarna sub 1	116	145	75.5	21.3	322.7	18.96	30.82	3287
22	Radha 12	115	148	111.5	25.3	260.3	25.71	42.77	3647
23	Sabitri	115	147	90.1	22.7	296.0	20.59	35.29	3793
24	Hardinath-1	84	120	106.5	24.8	257.0	30.73	25.46	3036
	F-test	**	**	**	**	**	**	**	**
	Grand mean	100.2	133.2	103.1	25.6	266.1	24.2	21.9	4378
	LSD at (0.05)	5.4	1.4	6.7	1.9	54.2	6.3	10.6	1147
	CV %	3.3	0.6	3.9	4.6	12.5	16.0	29.8	16.1

During 2012, there were also two sets of experiment. In set one, 10 varieties were tested (Table 3). Radha-4 (inbred variety) was used as standard check and among the tested entries the top grain yield was produced by Rashi 111 (5795 kg ha⁻¹) followed by Shanti 986 (4760 kg ha⁻¹) and Laxmi 117 (4679 kg ha⁻¹)

In case of set two, 30 varieties were tested and among them 28 were Indian hybrid and 2 (Swarna sub-1 and Sabitri) were inbred varieties used as standard check (Table 4) and among the tested entries the top grain yield was produced by DRH 748 (5556 kg ha⁻¹) followed by US 323 (5482 kg ha⁻¹) and Ruby (5281 kg ha⁻¹).

Table 3: Yield and ancillary characters of selected rice genotypes in Hybrid rice (set 1) conducted at Parwanipur, Bara, Nepal during 2012.

EN	Designation	Days to flowering	Days to maturity	Plant ht. (cm)	Panicle length (cm)	No. of tiller m ²	1000-grain wt. (gm)	Grain yield (kg ha ⁻¹)
1	Radha-4	97	126	99.3	24.7	271.3	27.12	4295
2	Rashi 111	101	129	98.5	26.1	275.0	30.30	5795
3	Shanti 986	99	126	94.4	23.5	273.3	28.31	4760
4	Akash	95	123	88.7	22.8	285.0	27.17	4463
5	DRH 836	104	132	85.1	25.6	279.7	26.54	4200
6	GIO	96	123	91.0	24.5	298.3	28.18	4274
7	Kriti	90	118	94.3	25.4	281.7	27.73	4063
8	Laxmi 117	99	128	96.9	25.1	240.0	27.54	4679
9	Garima 2	95	122	92.0	26.2	265.0	25.41	4533
10	US 316	95	122	87.7	23.2	250.0	26.32	4344
	F-test	**	**	**	*	*	*	*
	Grand mean	97.5	125.5	92.8	24.7	271.9	27.4	4540
	LSD at (0.05)	1.6	2.6	6.2	3.0	51.0	3.9	2190

Table 4: Yield and ancillary characters of selected rice genotypes in Hybrid rice (set 2) conducted at Parwanipur, Bara, Nepal during 2012.

E N	Designation	Days to flowering	Days to maturit y	Plant ht. (cm)	Panicle length (cm)	No. of tiller m ⁻²	1000-grain wt. (gm)	Grain yield (kg ha ⁻¹)
1	US 382	97	126	100.4	27.4	250.3	28.64	5188
2	Super 125	94	121	99.6	26.6	278.3	27.30	4890
3	Ruby	84	112	89.0	26.4	285.0	27.44	5281
4	Surabhi	94	122	102.9	26.8	242.3	29.00	4638
5	Samrat 200-12	88	114	93.4	25.2	264.7	28.23	5005
6	Samrat 200-17	91	120	94.0	27.2	254.0	29.21	4804
7	Delta rani	90	118	91.3	28.8	292.0	26.49	4564
8	Laxmi 144	97	125	94.0	27.2	284.3	27.74	4895
9	Rasmi 966	96	123	88.7	23.6	279.3	27.59	4293
10	Kailash	92	120	95.5	26.2	281.7	29.17	4185
11	Super 115	106	133	86.0	24.8	292.7	29.24	4522
12	US 314	94	124	95.8	27.3	243.7	28.48	4711
13	Kranti Gold	92	120	107.7	27.1	283.7	28.83	5208
14	US 359	85	113	99.8	25.3	269.7	29.73	5081
15	DRH 748	96	126	94.9	25.6	258.7	28.28	5556
16	RHR 333	97	126	90.7	25.8	275.0	29.00	4735
17	US 323	97	126	94.1	26.2	290.7	28.67	5482
18	Swarna Sub-1	94	120	95.4	27.3	262.1	26.90	4617
19	Laxmi 135	96	126	97.9	24.2	285.0	28.77	4519
20	DRH 834	92	121	94.5	28.0	260.3	28.04	4833
21	Mehar	85	112	90.2	26.8	292.3	27.08	4278
22	Laxmi Gold	98	127	92.4	22.7	298.3	26.81	4785
23	Sabitri	97	126	98.3	26.6	233.0	27.74	4707
24	DRH 775	96	126	87.6	25.8	281.0	27.84	5067
25	Laxmi 108	97	125	90.8	24.4	251.7	27.43	4901
26	Sagar 3	107	135	91.6	22.0	277.0	28.54	4407
27	RM-1 814	95	124	89.5	25.6	288.7	29.57	5162
28	8055	97	126	85.0	23.8	232.0	25.84	4293
29	Sudha 999	114	130	68.6	21.5	228.7	29.17	4096
30	Samrat 200-22	113	141	67.2	20.0	285.3	28.73	4385
	F-test	**	**	**	**	*	*	*
	Grand mean	96.0	124.0	92.2	25.5	270.0	28.1	4769.5
	LSD at (0.05)	1.8	6.5	7.6	2.2	57.5	2.7	1018
	CV %	1.1	3.2	5.0	5.4	13.1	5.9	13.1

4. Conclusion and Recommendation

Hybrid rice variety Indam 20017 (6409 kg ha⁻¹) and Ford 140 (5849 kg ha⁻¹) produced the highest grain yield during 2011 while Rashi 111 (5795 kg ha⁻¹) and DRH 748 (5556 kg ha⁻¹) produced the highest grain yield during 2012. Further these varieties should be tested in farmer's field condition for further recommendation.

5. Acknowledgment

The authors wish to express their appreciation to Nepal Agricultural Research Council (NARC), Nepal for providing necessary fund to conduct this research. Sincere thanks are due to Regional Director, RARS, Parwanipur for providing necessary facilities during the research.

References

- [1] IRRI, Terminal Report of the IRRI-ADB Project: Sustaining Food Security in Asia Through the Development of Hybrid Rice Technology, Los Banos (Philippines), International Rice Research Institute, 113p., 2005.
- [2] K. Gomez, A. Gomez, Statistical Procedures for Agricultural Research, John Wiley and Sons, USA, 1984.

[3] L. P. Yuan, Increasing Yield Potential in Rice by Exploitation of Heterosis, In: S. S. Virmani (edi.), Hybrid Rice Technology: New Developments and Future Prospects. Selected papers from the International Rice Research Conference. International Rice Research Institute, P.O. Box 933, Manila 1099, Philippines, 1994.

[4] MOAC, Statistical Information on Nepalese Agriculture, Ministry of Agriculture and Cooperatives, Agri-Business Promotion and Statistics Division, Singha Durbar, Kathmandu, Nepal, 2012.

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