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IDENTIFICATION OF HYBRID RICE *(Oryza Sativa L.)* AND ITS PARENTAL LINES BASED ON MORPHOLOGICAL CHARACTERS

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ABSTRACT
Identification and genetic purity testing of rice hybrids is crucial in harnessing their potential in carrying out scientific seed production and certification. The success of hybrid rice technology beside other factors depends on the production and timely supply of genetically homogenous seeds to farmer. This study is an attempt for characterization of local rice pollen parents and their hybrids using morphological markers**.** Seven qualitative and fourteen quantitative characters were recorded for morphological characterization of one Wild Abortive CMS lines (female) parent and ten pollen parents (male) and their ten hybrid combinations. Among seven qualitative characters five characters *viz*., leaf colour, stem internode colour, plant habit, Hull/grain colour decorticated grain shape and decorticated grain colour was suitable to use as markers to distinguish parental lines and their crosses (F_1). All quantitative characters found suitable to use as morphological markers. Among the quantitative characters grain related characters are more suitable, hence can be used for quick and rapid identification of hybrids and their parent. Morphological characters were most useful for differentiating parental lines and hybrids and hence could be successfully employed for genetic purity testing.

INTRODUCTION

Rice (*Oryza sativa* L.) is the major staple cereal food crop fulfilling about 60% dietary requirement, 20% calorie and 14% protein requirement of the world's population, but there is still a large gap between production and demand (Shrivastava *et al*., 2015).Globally, rice is the most important food grain from a nutritional, food security or economic perspective (Smith and Dilday, 2003). About 90 % of rice is grown and consumed in Asia. It contributes to total food and cereal production of the country to nearly 43% and 46% respectively (Bharti *et al*. 2014). The global annual production of rough rice is about 550-600 million tonnes from an area of about 150 million hectares (Maclean *et al*., 2002 and Bouman *et al*., 2007), of which 90 per cent is produced and consumed in Asia-Pacific region (Papademetriou, 2000). India is the second largest producers of rice in the world next to China. In India, rice is cultivated in an area of 44.0 million hectares with a production of 104.8 million tonnes of paddy (Anonymous, 2015). Rice constitutes over half of the cereals consumption of the country (Bharati *et al*., 2014). As population growth continues to boost demand for rice, production growth in all the ecosystems is approaching a plateau. Therefore, efforts to enhance rice productivity with keeping grain quality must receive top priority. Increasing rice production can be achieved by application of improved agronomic techniques, developing and adopting high yielding varieties. Major emphasis, in breeding program, is put on the development of improved varieties with superior qualitative and quantitative traits (Thakare *et al*., 2013). Among the various genetic options available for enhancing productivity levels, hybrid rice technology appears to be the most feasible and proven options. Since the release of first rice hybrids (APHR 1, APHR 2) in 1994, hybrid rice technology has been gaining importance in India, and till 2013 as many as 65 hybrid rice varieties have been released under public and private sectors. During the year 2011, around 2 m ha area was planted with hybrid rice in India (Singh *et al*., 2015). In Assam, during the year 2012-13, total area coverage under rice hybrids developed elsewhere was 97.2 thousand hectare, which is 3.9 per cent of the total area under rice in Assam (Economic Survey, Assam, 2012-13).

At present hybrid seed production in rice is primarily based on three-line system, which involves a cytoplasmic male sterile (CMS) line or A line, a corresponding iso-nuclear maintainer (B) line and a genetically diverse restorer (R) line. The most widely used CMS in rice is based on wild abortive (WA) cytoplasm derived from *Oryza sativa f.* sp. *spontanea* (Lin and Yuan, 1980; Li and Yuan, 1986). WA based CMS lines are highly stable and also show complete pollen sterility. The A line is maintained by crossing it with B line and hybrid seed is produced by crossing A line with R line. Assessment and maintenance of genetic purity of the parental lines and hybrids is crucial for the successful adoption of hybrid rice technology. It has been estimated that 1% impurity in the hybrid seed brings down the potential yield of hybrid rice by about 100 kg ha^{-1} (Mao *et al*., 1996). The present research work was

proposed on the basis of various reports to carry out preliminary works for development of potential hybrids for Assam with the following broad objectives: To identify hybrid and its parental lines based on morphological markers.

MATERIALS AND METHODS

The experimental material comprised of 11 genotypes which included a wild abortive cytoplasmic male sterile (WA CMS) line and 10 restorers lines used for production of rice hybrids. The genotypes were obtained from Hybrid Rice Programme of the Department of Plant Breeding and Genetics, Assam Agricultural University. The genotypes were raised in rain shelter situated at the Instructional cum Research (ICR) farm of Assam Agricultural University (AAU), Jorhat following standard package of practices. The CMS line and the restorers involved in the crossing programme for production of hybrid seeds through manual emasculation and pollination are presented in Table 1.

Experimental methods

Raising the nursery

Well filled and healthy seeds of the genotypes were first soaked in 0.1 percent Bavistin solution for 24 hrs and then incubated for 48 hours. The germinated seeds were then sown in nursery beds. The two CMS lines were staggered sown on 9th, 16th and 23rd February, 2013 and the restorer lines on 16th February, 2013 for synchronization of flowering. Seed rate was 10 g for the CMS lines and 40 g for the restorer lines.Hybrid seeds obtained through manual pollination during early *Ahu* along with the parents were raised during Sali 2013. Seeds were sown in plastic trays of approximate size 57 cm x 36 cm x 18 cm filled with paddy field soils to a depth of 15 cm.

Transplanting

Twenty seven days old rice seedlings were transplanted in the main field and before panicle initiation, the hills were transferred to pots kept under rain shelter for crossing during early *Ahu*, 2013.The hybrids along with the parents were evaluated during *Sali*, 2013 in pot experiment. The experiment was laid out in completely randomized design (CRD) with 7 replicates (pots) for each entry. A single hill was planted in each pot designated as one replication. Twenty seven days old seedlings were transplanted in puddle soils of the pots with one seedling per hill.

Pollen sterility (%)

Fifteen to twenty spikelets from just emerged panicles of the CMS lines were collected in test tubes containing 70 per cent ethanol. Take a glass slide; put. The anthers from at least 6 spikelets were taken out with the help of a forceps and placed in a drop of 1 per cent iodine potassium iodide (IKI) stain on a glass slide and were gently crushed by using a needle head to release the pollen grains. After the removing the debris, a cover slip was placed and the slide was observed under 40X of a compound microscope. Three random microscopic fields were observed for counting the sterile and the fertile pollens.

Crossing

Crossing was done by simply by pollinating the panicles of CMS lines at flowering. Prior to crossing, each hill originating from single seedlings of the CMS lines was tested for pollen sterility and those panicle showing 100 per cent pollen sterility were pollinated by the restorer lines to accomplish crossing. The crossed panicles were tagged and bagged to ensure genetic purity of the crossed seeds and to eliminate the chance of out crossing. Harvesting of the crossed panicles was done after thirty days of each crossing. These F_1 seeds were sundried to below 12 per cent moisture content, put in laminated envelop inside polythene zip bag and stored in refrigerator.

Observation procedur

Observations were recorded on all seven hills during *Sali*season, 2013 as per guidelines from UPOV.,1985 and DUS.,2007 of PPV and FR Authority, Govt. of India, New Delhi. Leaf colour,Leaf length,Leaf width (cm), Stem length (cm),Stem thickness (mm),Stem: internode colour,Days to 50% heading,Panicle length (cm), Panicle number per plant, Panicle: presence of awn,Plant habit,Time of maturity,Grain length, Grain width (mm),Hull/ grain colour,Decorticated grain length,Decorticated grain width ,Decorticated grain shape,Decorticated grain colour,Grain L/B ratio,Thousand grain weight

Statistical analysis

Analysis of variance for the quantitative characters were performed on individual hybrids and their respective parental lines separately as per completely randomized design (Panse and Sukhatme, 1973) .The standard error of difference between means was calculated by using the following expression:

$$SE_d = \frac{S}{\sqrt{\frac{2 \times MSE}{r}}}$$

RESULTS AND DISCUSSION

Characterization Based on Qualitative Traits

Out of 7 qualitative characters only 5 characters namely leaf colour, stem internode colour, plant habit, decorticated grain shape and decorticated grain colour were found useful for distinguishing the parental lines and hybrids. The remaining 2 qualitative characters namely panicle: presence of awn, hull/ grain colour did not show much variation and thus were found not useful (Table 2).

The most common leaf colour was green (7 genotypes) followed by dark green (IR68888A, Kolong and IR68888A/ Basantbahar) and medium green for Joria. The rest parental lines and their hybrids showed light green leaf colour. This diagnostic morphological marker could be used for identification of hybrids namely IR68888A/Joria and IR68888A/Luit with light green and IR68888A/Kolong with green leaf colour distinguishing them from their parents.Based on stem internode colour, the genotypes were categorized into two groups. Eleven genotypes possessed green colour internode and the remaining parental lines and hybrids had light green colour internode (Thimmanna *et al.,* 2000) Thus stem internode colour could be used as a diagnostic character for identification of the hybrid IR68888A/Luit having different internode colour from its parents.Three distinct classes were observed with respect to plant habit. Among the parental lines,

Table 1: Details of hybrids and their parents used in study

Sl. No	CMS line	Restorer line	Hybrid(F1)
1.	IR 68888A (2A)	Basantbahar	IR68888A/Basantbahar
2.		Chilarai	IR 68888A /Chilarai
3.		Dikhow	IR 68888A/ Dikhow
4.		IR 36	IR 68888A /IR 36
5.		Joria	IR 68888A/ Joria
6.		Kapilee	IR 68888A/ Kapilee
7.		Koimurali	IR 68888A /Koimurali
8.		Kolong	IR 68888A/ Kolong
9.		Luit	IR 68888A/ Luit
10.		Teraboli	IR 68888A /Teraboli

Table 2: Qualitative characters of the parents and their hybrids

Parent/Hybrid(F1)	Leaf colour	Stem: internode colour	Panicle: presence of awn	Plant habit	Hull/ grain colour	Decorticated grain shape	Decorticated grain colour
IR68888A	Dark green	Green	Absent	Erect	Gold	Spindle-shaped	Light brown
Basantbahar	Green	Green	Absent	Erect	Straw	Spindle-shaped	Light brown
IR68888A/Basantbahar	Dark green	Green	Absent	Semi-erect	Gold	Spindle-shaped	Light brown
Chilarai	Green	Green	Absent	Semi-erect	Straw	Spindle-shaped	Light brown
IR68888A/Chilarai	Green	Green	Absent	Semi-erect	Gold	Semi round	Light brown
Dikhow	Light green	Light green	Absent	Erect	Straw	Long spindle-shaped	Whitish
IR68888A/Dikhow	Light green	Light green	Absent	Semi-erect	Gold	Semi round	Whitish
IR 36	Light green	Light green	Absent	Erect	Straw	Long spindle-shaped	Brown
IR68888A/IR 36	Light green	Green	Absent	Semi-erect	Gold	Spindle-shaped	Light brown
Joria	Medium green	Light green	Present	Erect	Red	Spindle-shaped	Red
IR68888A/Joria	Light green	Light green	Absent	Semi-erect	Gold	Spindle-shaped	Light brown
Kapilee	Light green	Light green	Absent	Erect	Brown	Spindle-shaped	Light brown
IR68888A/Kapilee	Light green	Light green	Absent	Spreading	Gold	Spindle-shaped	Whitish
Koimurali	Light green	Light green	Absent	Spreading	Straw	Spindle-shaped	Whitish
IR68888A/Koimurali	Light green	Light green	Absent	Spreading	Gold	Spindle-shaped	Whitish
Kolong	Dark green	Green	Absent	Semi-erect	Straw	Long spindle-shaped	Brown
IR68888A/Kolong	Green	Green	Absent	Spreading	Straw	Half spindle-shaped	Light brown
Luit	Green	Green	Absent	Erect	Gold	Long spindle-shaped	Light brown
IR68888A/Luit	Light green	Light green	Absent	Semi-erect	Straw	Half spindle-shaped	Whitish
Teraboli	Green	Green	Absent	Erect	Straw	Long spindle-shaped	Whitish
IR68888A/Teraboli	Green	Green	Absent	Semi-erect	Straw	Spindle-shaped	Whitish

erect plant habit was observed for eight genotypes followed by semi-erect (Chilarai and Kolong) and spreading (Koimurali) also observed plant habit as one of the distinguishing characters. This morphological marker could be used as a diagnostic character for identification of eight hybrid combinations from their parents in the present study. Four distinct types for decorticated grain shape were observed among the parental lines and their hybrid combinations. These were long spindle shaped grains (4 genotypes), semi round (IR68888A/Chilarai and IR68888A/Dikhow), half spindle shaped (IR68888A/Kolong and IR68888A/Luit) and spindle shaped for the remaining hybrids and parents.Decorticated grain shape could be used as a diagnostic character for the hybrid combinations namely, IR68888A/Chilarai, IR68888A/ Dikhow, IR68888A/Kolong and IR68888A/Luit having distinct grain shape from their respective parents.Three distinct types were observed for decorticated grain colour. White decorticated grain colour was observed as the most common in 8 genotypes followed by red (Joria) while the remaining parental lines and hybrids had light brown grain colour. Thus decorticated grain colour differentiated the hybrids namely IR68888A/Kapilee and IR68888A/Luit from their respective parents with light brown grain colour. The expression level of a character may vary with the change in the genetic background. The variety Joria was awned and the rest parental lines and hybrids were awnless, thus distinguishing Joria from rest parents and hybrids. Moreover, Joria had distinct red grain colour which was strikingly different from the remaining cultivars.

The grain characteristics could be successfully employed to distinguish the tested parental lines and their hybrids. The morphological variability for qualitative traits among the parents and their hybrids was due to variable genetic background of the cultivars. Absence of variation for certain characters might be due to selection toward similar direction for these characters.

Characterization Based on Quantitative Traits

Significant variation was observed among the genotypes (hybrids and parents) for most of the quantitative traits. Quantitative traits are governed by polygenes with small

Table 3: Mean performances for 14 quantitative characters in ten hybrids and their parental lines

Parent/Hybrid(F1)	Leaf length (cm)	Leaf width (cm)	Stem length cm)	Stem thickness (cm)	Days to 50 flowering	Panicle length (cm)	Panicles per plant	Days to maturity	Grain length (mm)	Grain width (mm)	Decorticated grain length (mm)	Decorticated grain width (mm)	Grain L/B ratio	Thousand grain weight (g)
IR68888A	34.37	1.09	29.77	0.8	74.86	24.48	5.29	109.29	7.99	2.88	5.91	2.14	2.69	20.37
Basantbahar	32.64	1.19	28.27	0.39	79.57	25.02	5.14	111	6.77	2.29	5.15	1.94	2.81	26.46
IR68888A/Basantbahar	32.11	1.32	30.14	0.66	81.57	29.8	6.43	111.43	8.79	2.97	7.06	2.95	2.94	29.17
Mean	33.04 ± 1.03	1.19	10.75	0.61	78.66	26.43	5.61	110.57	7.84	2.71	6.03	2.34	2.81	25.33 ± 0.24
± SE_m		± 0.07	± 0.34	± 0.31	± 0.58	± 0.33	± 0.28	± 0.62	± 0.14	± 0.07	± 0.07	± 0.03	± 0.07	
CD (5%)	NS	NS	0.88	0.09	1.77	0.84	0.71	NS	0.37	0.18	0.18	0.1	NS	0.62
Chilarai	32.96	1.2	27.29	1.05	90.43	23.68	5.43	129.29	6.06	2.41	5.6	2.31	2.58	23.06
IR68888A/Chilarai	36.85	1.37	28.13	1.34	102.29	28.97	6.29	129	8.12	4	6.06	3.07	2.12	25.22
Mean	34.72 ± 0.68	1.22	13.57	1.06	89.19	25.71	5.66	122.52	7.38	3.09	5.85	2.5	2.46	22.88
± SE_m		± 0.06	± 0.30	± 0.10	± 0.74	± 0.26	± 0.28	± 0.46	± 0.11	± 0.07	± 0.08	± 0.06	± 0.09	± 0.22
CD (5%)	1.73	0.17	0.78	0.26	1.88	0.68	NS	1.16	0.28	0.2	0.21	0.17	0.24	0.57
Dikhow	31.6	1.33	28.17	1.09	78.14	26.47	5.43	129.57	9.29	2.62	7.17	2.36	3.64	29.52
IR68888A/Dikhow	38.96	1.31	30.77	1.35	76.43	30.04	6.14	128.71	7.76	3.19	6.73	2.46	2.31	31.52
Mean	34.98 ± 0.70	1.24	12.92	1.07	76.47	26.99	5.61 ±0.33	122.52	8.34	2.9	6.6	2.32	2.88	22.13
± SE_m		± 0.07	± 0.50	± 0.10	± 0.70	± 0.33		± 0.47	± 0.15	± 0.09	± 0.06	± 0.10	± 0.11	± 0.24
CD (5%)	1.77	NS	1.27	0.26	1.79	0.83	NS	1.2	0.39	0.25	0.17	NS	0.28	0.62
IR 36	35.5	1.02	29.83	1.15	97.71	25.78	4.57	129.29	9.5	2.3	7.37	2.27	4.05	24.27
IR68888A/IR 36	35.42	1.2	30.86	1.33	76.86	26.01	5.43	110	8.18	3.06	7.14	3.03	2.66	25.27
Mean	35.09 ± 0.74	1.1	12.75	1.09	83.14	25.42	5.09	116.19	8.55	2.74	6.8	2.48	3.13	23.3
± SE_m		± 0.05	± 0.49	± 0.09	± 0.57	± 0.31	± 0.26	± 0.58	± 0.14	± 0.07	± 0.08	± 0.04	± 0.10	± 0.24
CD (5%)	NS	NS	1.24	0.25	1.44	0.79	NS	1.28	0.36	0.18	0.21	0.11	0.27	0.61
Joria	39.01	1.14	28.67	0.83	89.29	27.15	5.29	115.57	7.22	2.56	5.19	2.42	2.87	17.59
IR68888A/Joria	36.65	1.22	30.03	1.12	77	27.98	5.57	132.29	7.36	2.64	5.33	2.32	2.75	17.45
Mean	36.67 ± 0.65	1.15	15.83	0.91	80.38	26.53	5.38	119.04	7.52	2.69	5.47	2.29	2.76	18.46
± SE_m		± 0.07	± 0.33	± 0.06	± 0.60	± 0.30	± 0.26	± 0.55	± 0.13	± 0.08	± 0.07	± 0.04	± 0.07	± 0.24
CD (5%)	1.65	NS	0.84	0.17	1.53	0.77	NS	1.39	0.34	0.21	0.19	0.1	NS	0.61
Kapilee	41.06	1.21	28.71	0.77	80.86	29.35	6.29	130	8.96	2.94	6.5	2.35	2.91	26.58
IR68888A/Kapilee	37.53	1.37	29.4	0.99	76.29	27.17	5.43	130.43	8.06	3.02	6.09	2.64	2.66	24.82
Mean	37.65 ± 0.70	1.22	12.92	0.85	77.33	26.99	5.66	123.23	8.33	2.94	6.16	2.37	2.75	23.92
± SE_m		± 0.07	± 0.55	± 0.03	± 0.59	± 0.26	± 0.31	± 0.68	± 0.16	± 0.05	± 0.07	± 0.04	± 0.04	± 0.28
CD (5%)	1.78	0.18	1.4	0.08	1.51	0.67	NS	1.73	0.27	NS	0.19	0.12	0.12	0.72
Koimurali	26.37	1.1	28.14	0.89	89.71	24.07	4.86	129	7.38	2.62	5.08	2.58	3	19.47
IR68888A/Koimurali	36.62	1.21	28.39	1.53	76.14	29.24	6.29	129.57	8.1	3.05	5.12	3.11	2.6	22.64
Mean	32.45 ± 0.70	1.33	17.27	1.07	80.23	25.92	5.47	122.61	7.82	2.85	5.37	2.61	2.76	20.82
± SE_m		± 0.03	± 0.54	± 0.05	± 0.08	± 0.25	± 0.27	± 0.54	± 0.12	± 0.07	± 0.04	± 0.03	± 0.08	± 0.20
CD (5%)	1.79	NS	1.39	0.15	0.21	0.65	0.7	1.37	0.31	0.2	0.12	0.09	0.23	0.51
Kolong	32.37	1.16	28.27	0.79	75.57	27.03	5.71	109.86	8.96	2.89	6.43	2.23	3.09	22.85
IR68888A/Kolong	31.75	1.34	30.09	0.87	76.57	26.09	5.43	109.57	7.04	3.11	5.13	3.08	2.23	22.69
Mean	32.83 ± 0.62	1.19	10.91	0.81	75.66	25.86	5.47	109.57	7.99	2.96	5.82	2.48	2.67	21.97
± SE_m		± 0.05	± 0.37	± 0.03	± 0.56	± 0.23	± 0.31	± 0.53	± 0.11	± 0.06	± 0.07	± 0.03	± 0.05	± 0.21
CD (5%)	1.58	0.13	0.93	NS	NS	0.59	NS	NS	0.28	0.15	0.19	0.09	0.13	0.54
Luit	32.36	1.31	30.03	0.97	73.14	24.71	5	109.71	8.43	2.63	6.66	2.37	3.33	25.95
IR68888A/Luit	31.57	1.11	30.11	1.05	76.57	26.54	5.43	111.43	8.16	4.08	6.11	3.08	2.14	27.13
Mean	32.76 ± 0.68	1.16	9.98	0.93	74.85	25.24	5.23	110.14	8.19	3.19	6.22	2.52	2.72	24.48
± SE_m		± 0.04	± 0.31	± 0.04	± 0.57	± 0.27	± 0.26	± 0.52	± 0.13	± 0.07	± 0.07	± 0.03	± 0.12	± 0.21
CD (5%)	1.72	0.12	0.8	0.12	1.45	0.7	NS	1.32	NS	0.18	0.19	0.1	0.31	0.53
Teraboli	31.26	1.01	28.97	0.95	91.86	23.45	4.71	116.29	7.38	2.48	5.18	2.22	3.01	15.18
IR68888A/Teraboli	32.45	1.16	30.09	1.08	97	25.12	5.86	131.57	9.05	3.03	6.06	3.06	2.96	16.22
Mean	32.69 ± 0.69	1.08	14.62	0.94	87.9	24.35	5.28	119.04	8.13	2.79	5.71	2.47	2.88	17.25
± SE_m		± 0.03	± 0.70	± 0.03	± 0.60	± 0.26	± 0.27	± 0.53	± 0.11	± 0.06	± 0.06	± 0.04	± 0.06	± 0.20
CD (5%)	1.73	0.09	NS	0.09	1.52	0.67	0.7	1.36	0.29	0.15	0.17	0.11	0.16	0.53

cumulative effect and highly influenced by environmental factors; resulting in continuous variation for these characters (Table. 3). Although qualitative characters are considered as suitable morphological markers in identification of land races of rice because they are less influenced by environmental changes, (Subba Rao *et al.,* 2013) suggested that quantitative characters have their role in variety identification system. Most of the pollen parents used in present study consists largely of landraces which are selected locally across many years based on recognizable morphological characters. These pollen parents are characterised by adaptation to local microclimates and pedo-climate of the farmer fields. The genetic diversity of the pollen parents and seed parent (IR68888A) also led to variability in the hybrid combinations.

Significant variation for all the 14 quantitative characters were recorded among the genotypes. Out of 14 characters, panicle length, decorticated grain length and thousand grain weights showed significant difference in most of the hybrid combinations and parental lines. Thus, these characters could also be successfully employed for differentiating parental lines and hybrids. Mean leaf length varied from 26.37 cm (Koimurali) to 41.06 cm (Kapilee). This character could distinguish hybrids from its parental lines. For leaf width, only 3 hybrids namely IR68888A/Chilarai, IR68888A/Koimurali and IR68888A/Kolong were significantly different from both the parents and the rest 7 hybrids could not be distinguished from both the parents.Significant difference for stem length between the hybrids and their respective parents was noted for IR68888A/Chilarai and both its parents only and the rest 9 hybrids were significantly at par with their respective parents. With respect to stem thickness, 7 hybrids namely IR68888A/ Basantbahar, IR68888A/Chilarai, IR68888A/Dikhow, IR68888A/Joria, IR68888A/Kapilee, IR68888A/Koimurali and IR68888A/Teraboli were significantly different from both their parents. These two characters revealed significant variation among hybrids and their parents, indicating that stem length and stem thickness were helpful diagnostic characters in this study.

With respect to days to 50 per cent flowering, 7 hybrids were significantly different from both their parents. Similarly, the hybrids namely IR68888A/Joria, IR68888A/Luit and IR68888A/ Teraboli) were distinct from both their parents for days to maturity. Eight hybrids were found significantly different from both their parents in respect of panicle length hence could be used as a diagnostic character. Only 3 hybrids namely IR68888A/Basantbahar, IR68888A/Chilarai and IR68888A/ Koimurali were distinguished from their respective CMS and restorer parents in respect to panicles per plant. Based on grain length, 3 hybrids namely IR68888A/Basantbahar, IR68888A/Kolong and IR68888A/Teraboli could be distinguished from both their parents. Six hybrids had significantly different grain width from both their parents. (Sarawgi *et al.,* 2013) also observed significant differences in grain width among rice genotypes.Five hybrids could be distinguished from both the parents for decorticated grain length. Based on decorticated grain width, 9 hybrids were significantly different from both their parents. For grain L/B ratio, only 4 hybrids were significantly different from both their parents. Statistically significant difference was observed for most of the grain characters; hence these could be used as diagnostic characters for identification of hybrids and their respective parents. Eight hybrids were significantly different from their respective parents with respect to thousand grain weights. Similar variation in thousand grain weights was also obtained by (Kumar *et al.,* 2011) among A, B and R lines.

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