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SCREENING OF EARLY MATURING RICE VARIETIES/HYBRIDS SUITABLE FOR DRY DIRECT SEEDED CONDITION

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ABSTRACT
An investigation was carried out to evaluate the thirty six early maturing rice varieties/hybrids under Dry Direct Seeded condition during *Kharif* 2014 at Agriculture Research Station, Gangavathi, University of Agricultural Sciences, Raichur, Karnataka following randomized block design in three replications. Number of tillers per plant at maturity was significantly highest (22.50) in the genotype MT4331 followed by IET 22729 (22.10).Significantly maximum panicle weight (25.43g) was recorded in the genotype RYC 684 followed by US 321 (22.70g).Significantly maximum tillers per square meter (804) was recorded in the genotype IET 22729 followed by MT4331 (729).Out of 36, only two varieties viz, MT4541 (7927 kg/ha) and UPR 2805-14-1-2 (7058 kg/ha) had expressed significantly superior grain yield over check Sahbhagidhan (6258 kg/ha) to an extent of 27 per cent and 13 per cent respectively. The variety 13K 4070 with medium slender grain type had yielded significantly higher grain yield (6970 kg/ha) with 11 per cent increase over Sahbhagidhan and 34 per cent over Local Check (ES-18).The promising genotypes will be further evaluated in multilocation trials under dry direct seeded condition to confirm stability in grain yield and further use as breeding lines.

INTRODUCTION

Rice (Oryza sativa L.) is one of the most ancient crops being cultivated in 117 countries, hence called as "Global Grain". It is the staple cereal food grain of majority of India's over one billion population, contributes to nearly 44% of total food grain production. The production of conventional puddled transplanted rice faces severe constraints because of water and labour scarcity, and climatic changes (Pathak *et al*., 2011). Imminent water crisis, water-demanding nature of traditionally cultivated rice and climbing labour costs ramble the search for alternative management methods to increase water productivity, system sustainability and profitability. Direct seeded rice (DSR) technique is becoming popular nowadays because of its low-input demanding nature. It offers a very exciting opportunity to improve water and environmental sustainability. It is a feasible alternative to conventional puddled transplanted rice with good potential for saving water, mitigating greenhouse gas emissions, and adapting to climatic risks; and the yield can be comparable with that of transplanted rice if the crop is properly managed (Kumar and Ladha, 2011).It involves sowing pre-germinated seeds into a puddled soil surface (wet seeding), standing water (water seeding) or dry seeding into a prepared seedbed (dry seeding). Recently there is trend towards direct seeded rice because of labour and water scarcity (Mallikarjun *et al*., 2014).Although the development of suitable varieties and agronomic packages for promoting direct-seeded rice is under way (Pathak *et al*., 2011), so far no variety has been developed that possesses traits specifically needed to produce high yield under dry direct-seeded conditions, particularly for rainfed systems that may be prone to drought and low fertility.Hence in the present investigation, early-maturing rice varieties/hybrids have beenevaluated under Dry Direct Seeded condition.

MATERIALS AND METHODS

The experiment was carried out in the Agriculture Research Station Gangavathi, University of Agricultural Sciences, Raichur, Karnataka during *kharif* season 2014 to evaluate the thirty six early maturing rice varieties/hybrids under Dry Direct Seeded condition received from the IRRI, India office, ICRISAT Hyderabad, with ES-18 as the local early maturing check.The varieties/hybrids were sown on 06.08.2014 in a randomized block design with three replications and each plot measured 6.4msq. Seeds were sown with spacing of 20cm between rows and 15cm between plants. Agronomic practices and weed management was followed as per the recommendations of direct seeded rice management protocols (Seema *et al.,* 2014 and Sihag *et al.,* 2015). The mean data was statistically analysed by adopting the appropriate methods outlined by Panse and Sukhatme (1978) and Sundarajan *et al*. (1972). The critical differences were calculated at five per cent level of probability, wherever 'F' test was significant.

RESULTS AND DISCUSSION

The emergence was recorded significant differences among the thirty six rice varieties/hybrids evaluated for the dry direct seeded condition.The genotype MT4542 recorded the

Table 1: Ancillary data of early maturing rice varieties / hybrids under Dry Direct Seeded condition at ARS, Gangavati during *Kharif* 2014.

Sl.No	Entry Name	Per cent Emergence	Per cent Vigour	Plant height at maturity (cm)	Panicle length maturity (cm)	Number of Tillers/ plant at Maturity
1	GNV-10-89	86.3	M	102.1	22.8	16.2
2	SVH-026 (Sava-124)	90	M	105.1	21.6	17.9
3	Bio 648	88.3	H	106.8	23.6	19.5
4	IET 22729	80	M	104	22	22.1
5	MT4541	88.3	M	101.1	24	18.1
6	UPR 3860-6-1	71.7	M	87.8	28	18.5
7	MT4375	85	H	114.7	19	19.4
8	MT4577	88.3	H	90	19.6	18
9	NPH 2010	86.7	H	127.9	23.8	19.5
10	UPR 2805-14-1-2	93	H	127.7	24.8	20.2
11	MT4331	91.7	M	105	23.2	22.5
12	RYC 684	85	H	122.4	23.4	19.1
13	Sahyadri-4	81.7	H	98.3	21.6	18.2
14	UPR 3739-2-1-2	81.7	M	114.1	24.8	16.6
15	Arize 6129 Gold	83.3	H	98.1	19	18.9
16	RXEL-20	76.3	H	93.8	24.6	18.9
17	Sahbhagidhan (Check)	91.7	M	122.1	23	15.5
18	13K4070	90	M	91.3	20	17.7
19	MT4551	81.7	M	104.3	21.8	16.3
20	NP 107-5	80	H	101.9	22	20.9
21	INH10008	85	M	102.1	19.5	17.1
22	MT4542	95	H	107.3	24.4	19.3
23	SATYABHAMA	85	M	134.1	23.4	14.4
24	MT 4254	81.7	H	103.4	19.4	17.4
25	SVH-005 (Sava-127)	78.3	M	86.4	21.4	17.8
26	MT4343	81.7	M	108.7	23.8	19.1
27	US 348	93	H	99.9	24.8	16.6
28	CR Dhan-201	84.7	H	113.8	23.4	18.7
29	US 321	86.7	H	100.8	23	17.6
30	CR Dhan-206	71.7	M	115.1	23.6	19.7
31	MT4388	76.7	H	110.1	23.4	19.2
32	US 359	89.7	H	112.1	21.8	18.3
33	Local Check (ES-18)	89.7	M	91.6	19.2	18.5
34	IR 14R510	88.3	M	107.9	21	16.3
35	ADV 1417	86.7	H	96.6	21.6	17.5
36	NR 372	83.3	H	93.7	19.6	20.5
	Mean	84.94		105.61	22.39	18.39
	SE.M	0.84		1.18	1.03	0.39
	CD	1.98		3.39	2.97	1.11

Note:M-Medium,H-High

significantly highest emergence among the genotypes evaluated by recording 95 per cent of emergence followed by UPR 2805-14-1-2 and US 348 (93%).Significantly minimum (71.7%) per cent emergence was recorded with genotypes CR Dhan-206 and UPR 3860-6-1.

The results obtained on vigour are presented in Table 01. Among the thirty six genotypes evaluated for dry direct seeded condition, nineteen genotypes showed the high vigour while the remaining 17 genotypes showed the medium vigour level.

Significant differences on plant height at maturity were recorded among the thirty six genotypes. Significantly maximum plant height (134.10cm) was recorded in the genotype Satyabhama followed by NPH 2010 (127.90cm) and UPR 2805-14-1-2 (127.70cm). While the genotype SVH-005 (Sava-127) recorded significantly minimum (86.40cm) plant height among the genotypes evaluated.

The results obtained on panicle length at maturity are presented in Table 01. Among the thirty six genotypes evaluated for dry direct seeded condition, the genotype UPR 3860-6-1 recorded significantly highest panicle length (28.00cm) and the significantly lowest panicle length (19.00cm) was in the genotypes Arize 6129 Gold and MT4375.Number of tillers per plant at maturity was significantly highest (22.50) in the genotype MT4331 followed by IET 22729 (22.10) which were on par with each other. The genotype Satyabhama recorded significantly lowest (14.40) number of tillers per plant among the genotypes evaluated which was on par with the genotype Sahbhagidhan(15.50).Among the thirty six genotypes evaluated for dry direct seeded condition, Sahbhagidhan (81.00 days) was the earliest to days to 50 percent flowering followed by local check (81.70 days) and US 321 (83.00 days).

The results obtained on lodging are presented in Table 02.Among the thirty six genotypes evaluated for dry direct seeded condition;twenty three genotypes were non lodging while the remaining thirteen genotypes showed the lodging. The semi-dwarf varieties resist lodging and are more responsive to fertilizers (Khush, 1984). Therefore, they were found more

Table 2: Grain yield and ancillary data of early maturing rice varieties / hybrids under Dry Direct Seeded condition at ARS, Gangavati during Kharif 2014

Sl.No	Entry Name	Day to 50% flowering	Lodging	Grain wt. /sq m (kg)	1000 Grain wt. (g)	Avg. 5 Panicle wt. (g)	Number Tiller/ Sq m	Grain yield (Kg/ha)	Grain size	Per cent increase over best Check
1	GNV-10-89	87	NL	0.57	17	20.77	540	6215	MS	-1
2	SVH-026 (Sava-124)	88	NL	0.6	24	17.4	628	6255	LB	0
3	Bio 648	84.7	NL	0.63	23	21.8	632	6316	LB	1
4	IET 22729	88.3	NL	0.71	26	19.7	804	6924	MS	11
5	MT4541	87.7	NL	0.62	22	19.6	568	7927	LB	27
6	UPR 3860-6-1	85		0.27	11	19.63	562	3599	MS	-42
7	MT4375	88.7	L	0.34	12	20.5	595	5161	LB	-18
8	MT4577	81	NL	0.42	24	21.3	612	5453	SB	-13
9	NPH 2010	86.3	L	0.39	23	15.7	597	3992	MB	-36
10	UPR 2805-14-1-2	87	L	0.78	30	20.8	613	7058	LB	13
11	MT4331	84.7	NL	0.68	25	18.4	729	6610	LB	6
12	RYC 684	85.3	L	0.61	27	25.43	600	6840	LB	9
13	Sahyadri-4	86.3	NL	0.2	18	16.23	540	3953	MS	-37
14	UPR 3739-2-1-2	91.3	L	0.49	26	18.47	448	4943	LB	-21
15	Arize 6129 Gold	87	NL	0.65	22	19.6	650	5328	MS	-15
16	RXEL-20	91.7	NL	0.45	23	16.17	625	4125	LB	-34
17	Sahbhagidhan (Check)	81	L	0.65	23	15.77	487	6258	LB	0
18	13K4070	88.7	NL	0.71	17	12.7	636	6970	MS	11
19	MT4551	89	NL	0.72	25	18.77	539	6774	LB	8
20	NP 107-5	86.7	NL	0.78	15	20.1	593	5834	MS	-7
21	INH10008	90	NL	0.52	24	15.97	474	5631	LB	-10
22	MT4542	85	L	0.48	29	22.03	610	6166	LB	-1
23	SATYABHAMA	86	L	0.57	25	21.07	442	5881	SB	-6
24	MT 4254	95.3	NL	0.52	24	19.77	516	5730	LB	-8
25	SVH-005 (Sava-127)	89.7	NL	0.52	23	19.7	599	5877	LB	-6
26	MT4343	85.3	L	0.45	24	16.7	661	6023	SB	-4
27	US 348	90	NL	0.48	20	21.1	459	6018	LB	-4
28	CR Dhan-201	87.7	L	0.69	24	20.1	498	6740	LB	8
29	US 321	83	NL	0.59	20	22.7	639	6361	MS	2
30	CR Dhan-206	88	L	0.48	21	18.2	533	6007	LB	-4
31	MT4388	87.3	L	0.57	25	21.35	506	5694	LB	-9
32	US 359	91	L	0.49	26	21.63	560	5456	LB	-13
33	Local Check (ES-18)	81.7	NL	0.42	17	11.53	619	5185	MS	-17
34	IR 14R510	91	NL	0.55	17	17.13	542	5368	MS	-14
35	ADV 1417	86.7	NL	0.4	24	16.13	608	4966	SB	-21
36	NR 372	84.7	NL	0.12	23	12.3	525	4016	LB	-36
	Mean	87.16		0.53	22.19	18.78	577.47	5768		
	S.Em	0.92		0.04	0.34	0.84	24.03	299.2		
	CD (@ 5 %)	2.63		0.11	0.97	2.41	69	859		

Note: L-Lodging,NL-Non lodging, LS-Long slender, LB-Long bold, MS-Medium slender, MB-Medium bold, SB-Short bold, SS-Short slender.

suitable for direct seeding (Awan *et al*. 1979).Among the thirty six genotypes evaluated for dry direct seeded condition, the genotype UPR 2805-14-1-2 and NP 107-5 recorded significantly highest grain weight per square (0.78 kg) followed by 13K4070 and IET 22729 (0.71kg) which were on par with each other and the significantly lowest grain weight per square (0.12 kg) was recorded in the genotypes NR 372.

Thousand grain weight was significantly highest (30.00g) in the genotype UPR 2805-14-1-2 followed by MT4542 (29.00g). The genotype UPR 3860-6-1 recorded significantly lowest (11.00g) thousand grain weight among the genotypes evaluated followed by the genotype MT4375 (12.00g).

Significant differences on average five panicle weight were recorded among the thirty six genotypes. Significantly maximum panicle weight (25.43g) was recorded in the genotype RYC 684 followed by US 321 (22.70g). While the genotypes Local Check (ES-18) (11.53g),NR 372 (12.30g) and 13K4070 (12.70g) recorded significantly minimum average five panicle weight among the genotypes evaluated.

Significant differences on tillers per square meter were recorded among the thirty six genotypes. Significantly maximum tillers per square meter (804) was recorded in the genotype IET 22729 followed by MT4331 (729). While the genotypes satyabhama (442) recorded significantly minimum tillers per square meter among the genotypes evaluated.

The results obtained on grain yield per hectare are presented in Table 02. Among the thirty six genotypes evaluated for dry direct seeded condition, the genotype MT4541recorded significantly highest grain yield per hectare (7927kg) followed by UPR 2805-14-1-2 (7058kg). While the genotype UPR 3860-6-1 recorded significantly lowest grain yield per hectare (3599kg) followed by Sahyadri-4 (3953kg) (Figure 1). Vigour, plant height, number of tillers per plant, panicle length and at maturity and thousand grain weight had positive correlation

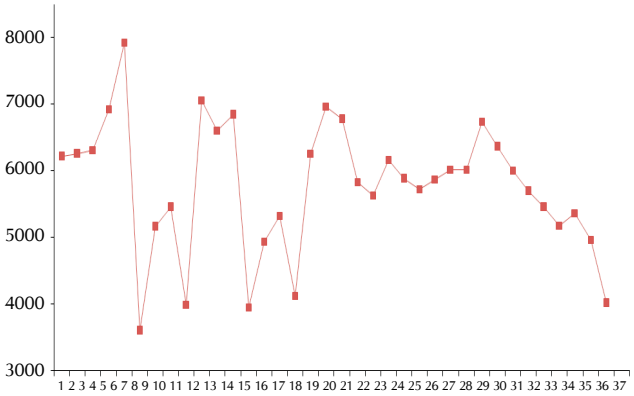

Figure 1: Grain yield kilograms per hectare of thirty six genotypes evaluated for dry direct seeded condition

with grain yield. Filled grains per panicle and thousand grain weight were found important yield contributing traits and confers with Perez *et al*. (1987), Manuel and Palanisamy (1991), Mehetre *et al*. (1994) and Akhtar *et al*. (2002).The higher values of yield attributes recorded were attributed to more number of tillers per unit area, better crop growth and development, higher photosynthetic efficiency also towards physiological maturity Dadhich *et al*. (2014).

Among the thirty six genotypes evaluated for dry direct seeded condition, twenty one genotypes showed the long bold grain size, eight genotypes showed the medium slender grain size, four genotypes showed the short bold grain size, one genotype showed the medium bold grain size while the remaining two genotypes showed the long slender grain size (Table 02).

The results calibrated on increase over best check are presented in Table 02. Among the thirty six genotypes evaluated for dry direct seeded condition, the genotype MT4541 recorded highest positive increase over best check (27 per cent) followed by UPR 2805-14-1-2 (13 per cent). While the twenty four genotypes were recorded negative increase over best check.

The past results of many years of experimentation on direct seeding technology has encouraged the researchers to do some extra efforts for increasing production and makes it an economically feasible technology. The technology has great potential for adoption as substitute for transplanting if the weeds are controlled properly. In the view of the same, thirty six early maturing rice varieties/hybrids were evaluated under dry direct seeded condition and few promising varieties and hybrids *viz*., MT4541, UPR 2805-14-1-2 and 13K 4070 showing positive increase in yield over the best checks were selected which are suitable for dry direct seeded condition, they will further evaluated under multi location trials for further confirmation of yield and yield contributing traits.

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