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Identification of aromatic short grain genotypes for high rainfall tract (zone ix) of Karnataka state

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Abstract
Experiment was conducted under shallow lowland conditions to test four rice genotypes against National (Badshah bhog) and Regional (Kala namak) check varieties for their 50% flowering, plant height, panicles sqm^{-1} and grain yield kg ha^{-1}, during 2013 and 2014 *kharif* season to identify the suitable genotype for the region. 50 percent flowering differed significantly among genotypes highest days to 50% flowering was recorded in IET 23879 (118 days) during 2014. Plant height showed significant difference among genotypes in 2013 and 2014. Maximum plant height of 132 cm was recorded in Badshabhog (NC) in 2014 followed by Kalanamak 117cm in 2013. Maximum number of panicles recorded in IET 23879 (330) in 2013 followed by IET 23864 (320) in 2013. Grain yield varied significantly among genotypes in 2013 and 2014. Maximum grain yield of 4919 kg ha^{-1} recorded by IET 23879 in 2014 followed by 4823 kg ha^{-1} by IET 23879 in 2013. Highest hulling was recorded by IET 23879 (83.5%) in 2013 and IET 23864 (83.3%) in 2014. Highest milling percentage, was recorded IET 23864 (73.0%) in 2013. Highest L/B ratio was observed by IET 23864 (3.17) in 2013. Moderate ASV was observed in all genotypes both in 2013 and 2014 except IET 23878 (3) in 2014. Highest AC was recorded by IET 23879 (24.59) in 2013. Highest GC was observed by IET 23878 (90) in 2013. Genotype IET 23879 showed significantly superiority over checks with desirable quality parameters may be recommended for the farmers under shallow low land situation of Zone 9 of Karnataka State.

Keywords: Rice, varieties, yield and grain components

Introduction
Rice (*Oryza sativa* L.) is not only the most important staple food crop in the world but also an excellent model monocotyledonous plant. Rice production scenario in the country during the past decade presents a gloomy picture of compound growth rate of just 1.7 percent despite the highest production figures (111 million tonnes from 43.92 million hectares) posted during 2018 (Anon. 2018). Land under rice is likely to be reduced further and could stabilize at about 40 million hectares. Due to erratic and inadequate rainfall, often rice crop suffers with soil moisture stress, continuous use of traditional varieties due to the non-availability of seeds and lack of awareness about high yielding varieties, heavy infestation of weeds and insects or pests, poor crop plant population in case of broadcasting method and poor adoption of improved crop production technology due to economic backwardness of the farmers. In the high-rainfall region, the rain-water was lost rapidly through deep percolation and outbreak of diseases. In the low-rainfall regions, the crop suffers from iron and zinc deficiency in some soils. To meet a production target of 125 million tonnes by 2025, all inclusive of food requirement, seed for cultivation, storage in buffer stock and a share for exports, productivity in irrigated area needs to be enhanced by 1.5 tonnes ha^{-1} and in rainfed lowlands by about 1 tonnes ha^{-1}.

In Karnataka around 50 percent of the total rice area (14.50 lakh ha) is under rainfed condition in which around 3 lakh hectare area is under transplanted high rainfall situation. Major drill sown rice area is spread along the Western Ghat Hills region of Karnataka in the districts of Madikeri, Shivamogga, Uttar Kannada, parts of Belgaum, Chikmagalur and Dharwad. The varietal requirement is also very much specific in this situation as evidenced by low (47%) adaptation of high yielding varieties (HYV) as against 80 percent adaptation of high yielding varieties in the state of Karnataka and 73 percent in India. One of the reasons for such a low level of HYV adaptation in rainfed ecology is due to non-availability of truly potential

cultivars specifically suited for such situations. This emphasizes the need for developing / identifying high yielding varieties/hybrids suitable to this region.

The average productivity of this region is 3 to 4.5 t ha^{-1}, moderately high compared to state average yield (2.50 t ha^{-1}) which is far below the potential of the region, obviously is a consequence of lack of suitable varieties. As well as due to several specific problems of this region. This tract is generally grouped into three situations based on elevation and water holding capacity *viz.,* uplands, midlands and lowlands. The good rice harvest of 5 to 6 t ha^{-1} in midlands and 6 to 8 t ha^{-1} in lowlands is possible under favorable conditions.

Material and Methods

Five genotypes along with check varieties were evaluated during *kharif* season from 2013 to 2014 at Agriculture Research Station (Paddy), Sirsi, Karnataka. The nursery sowing was taken up in the first week of June and planting of seedlings was done in the end of 4th week of June. The experiment was laid out in a randomized complete block design with three replications. Seedlings aged 20-25 days were transplanted with a spacing of 20 × 15 cm, five tonnes of FYM was applied during land preparation. Recommended dosage of P, 50% K and N (75:75:90 kg NPK ha^{-1}) was applied at the time of planting, 25% of N and 50% of K was top dressed at 30 and 25% of N at 40 days after planting. Observations on days to 50% flowering, plant height, Panicles/m^2, grain yield and grain quality characters were recorded at appropriate stage.

Results and Discussion

Experiment was conducted under assured rainfall conditions to test four rice genotypes against National (Badshabhog) and Regional (Kalanamak) check varieties for their 50% flowering, plant height, Panicles sqm^{-1}, grain yield kg ha^{-1} and grain quality characters during 2013 and 2014 (Table 1 & 2). *Kharif* season to identify the suitable genotype for the region. 50 percent flowering differed significantly among genotypes tested maximum days taken for 50% flowering was recorded for IET 23879 (118 days) in 2014 followed by IET 23864 (110) in 2014 and minimum days taken by IET 23878 (73 days) during 2013. Plant height showed significant difference among genotypes in 2013 and 2014. Maximum plant height of 132 cm was recorded in Badshabhog in 2014 followed by Kalanamak 117cm in 2013 and lowest plant height of 78 cm was recorded in IET23879 and IET23878 in 2014 and 2013. Number of panicles per square meter found to be differed significantly among genotypes. Maximum number of panicles recorded in IET 23879 (330) in 2013 followed by IET 23864 (320) in 2013. Grain yield varied significantly among genotypes in 2013 and 2014. Maximum grain yield of 4919 kg ha^{-1} recorded by IET 23879 in 2014 followed by 4823 kg ha^{-1} by IET 23879 in 2013 and lowest was recorded by Kalanamak (2257 kg ha^{-1}) in 2014.

Highest hulling was recorded by IET 23879 (83.5%) in 2013 and IET 23864 (83.3%) in 2014, lowest hulling was recorded by Badshabhog (77.7) in 2013. Highest milling percentage was recorded in IET 23864 (73.0%) during 2013 and lowest milling percentage was recorded by Kalanamak (65.8%) in 2013. Highest L/B ratio was observed by IET 23864 (3.17) in 2013 and lowest L/B ratio was observed by Badshabhog (1.95) in 2013. Moderate ASV was observed in all genotypes both in 2013 and 2014 except IET 23878 (3.0) in 2014. Highest AC was recorded by IET 23879 (24.59) in 2013 and lowest AC was observed by Badshabhog (21.38) in 2014. Highest GC was observed by IET 23878 (90) in 2013 and lowest GC was observed by IET 23878 (58) (Table 2). Similar results obtained by Surendra *et al.* 2018 [7]. Genotype IET 23879 showed significantly superiority over checks with desirable quality parameters may be recommended for the farmers under shallow low land situation of Zone 9 of Karnataka State.

Table 1: Performance of rice genotypes for 50% flowering (days), Plant height (cm), Panicle per square meter (number) and Grain yield (kg ha^{-1}) during 2013-14 Kharif season under high rainfall tract (Zone 9) of Karnataka State.

IET No	Days to 50% flowering		Plant height		Panicles/m^2		Grain yield	
	2013	2014	2013	2014	2013	2014	2013	2014
23879	83	118	78	95	330	307	4823	4919
23864	83	110	86	86	320	312	2989	3783
23878	70	99	81	78	301	299	4228	3707
Kalanamak(RC)	73	99	117	89	304	319	2749	2257
Badshabhog (NC)	78	106	86	132	294	301	2657	3268
G Mean	78.69	111	100.84	95	277.32	307	4226	3528
CV%	1.28	1.07	4.46	-	14.61	15.32	12.67	9.15
CD 5%	2.059	2.000	9.184	NS	82.765	84	1093.782	574

Table 2: Grain quality characteristics of entries in high rainfall tract (Zone 9) of Karnataka State during Kharif season of 2013-2014(Indian Institute of Rice Research 2015).

IET No	Hull		Mill		HRR		KL		KB		L/B		Grain type		Grain chalk	
	2013	2014	2013	2014	2013	2014	2013	2014	2013	2014	2013	2014	2013	2014	2013	2014
23879	83.5	82.0	70.9	72.9	68.2	71.5	5.41	5.61	1.84	1.88	2.94	2.98	MS	MS	A	A
23864	82.0	83.3	73.0	72.9	66.7	69.2	5.75	5.62	1.83	1.80	3.17	3.12	SS	SS	VOC	VOC
23878	79.0	80.03	70.5	70.8	69.0	70.0	5.68	5.81	2.03	2.05	2.79	2.83	MS	MS	VOC	VOC
Kalanamak (RC)	79.2	78.0	65.8	68.6	53.3	65.1	4.71	5.14	1.86	1.86	2.53	2.76	MS	MS	VOC	VOC
Badshabhog (NC)	77.7	80.8	68.5	72.7	68.0	72.5	3.84	4.05	1.96	1.93	1.95	2.09	SB	SB	VOC	VOC

HULL: Hulling (%); Mill: Milling (%): HRR: Head Rice Recovery (%); KL: Kernel Length (mm); KB: Kernel Breadth (mm);
L/B: Length and breadth ratio; Grain type: LB Long Bold; SB::Short Bold; LS: Long Slender; MS: Medium Slender;
SS: Short Slender. Grain Chalk: Grain Chalkiness; VOC: Very occasionally present; A: Absent

IET No	VER		WU		KLAC		ER		ASV		AC		GC		Aroma	
	2013	2014	2013	2014	2013	2014	2013	2014	2013	2014	2013	2014	2013	2014	2013	2014
23879	4.2	5.6	265	200	8.8	9.0	1.62	1.60	5.0	4.0	24.59	24.42	70	64	SS	SS
23864	4.4	5.2	240	195	9.6	11.3	1.66	2.01	4.0	4.0	23.70	21.47	80	65	SS	SS
23878	4.8	5.0	360	205	8.0	7.8	1.40	1.34	4.0	3.0	24.53	21.53	90	58	SS	MS
Kalanamak(RC)	4.1	5.6	245	215	7.0	7.8	1.48	1.51	4.0	5.0	24.20	22.64	78	64	SS	MS
Badshabhog (NC)	4.2	4.7	230	240	6.2	6.5	1.61	1.60	4.0	4.0	21.72	21.38	80	61	SS	SS

VER: Volume expansion ratio; WU: Water uptake; KLAC: Kernel Length after cooking; ER: Elongation ratio;
ASV: Alkali Spreading Value; AC: Amylose Content (%); GC: Gel Consistency

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