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Identifying promising rice genotypes with cold tolerance suitable for heavy rainfall hilly regions of Karnataka

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Abstract
The variety trials under hill ecosystem are conducted with an objective of identifying high yielding promising cultures with cold tolerance, three genotypes were evaluated under assured rainfall conditions against national (Vivekdhan 62) and regional (HPR 2143) check varieties during 2010, 2011 and 2012 *Kharif* season. Maximum panicle length of 22.9, 23.8 and 22.7 cm was recorded in IET 21765 during 2010, 2011 and 2012 respectively. Maximum grain yield of 4050, 4213 and 4009 Kg ha^{-1} recorded in IET 21759 during 2010, 2011 and 2012 respectively. Maximum straw yield of 9548, 9934 and 9452 Kg ha^{-1} recorded in HPR 2143 during 2010, 2011 and 2012 respectively. The genotype IET 21759 showed superiority over checks for productivity with desirable quality parameters hence could be suitable genotype for heavy rainfall hilly regions of Karnataka State.

Keywords: Rice, varieties, yield components, quality traits, hilly region

Introduction
Rice (*Oryza sativa* L.) occupies a pivotal place in the Indian agriculture. Rice is one of the world's most important staple food crops growing in at least 114 countries under diverse conditions (Anon., 2013) [2]. At the current rate of population growth accelerating at 1.8 percent, rice requirement by the year 2020 would be around 140 million tons (Anon., 2004) [1]. As population growth continues to boost demand for rice, production growth in all the ecosystems is approaching a plateau. Increasing rice production can be achieved by application of improved agronomic techniques, developing and adopting high yielding varieties (Thakare *et al*., 2013). Green revolution, though paved the way for a substantial increase in rice production leading to self-sufficiency and even surplus for exports, in the recent years deceleration of growth and crop yield from green revolution technologies surfaced. Among the various causes put forth for low yields in Karnataka, lack of varieties with yield stability under different climatic situations, is considered to be the foremost. 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 improved agronomic techniques and adopting high yielding varieties. With increase in yield, there is also a need to look into the quality aspects to have a better consumer acceptance, which determine the profit margin of rice growers which in turn dictates the export quality and foreign exchange. Grain quality characteristics are very important in rice breeding as it is predominantly consumed as a whole grain. The milling percentage, hulling percentage, grain dimensions, cooking quality constitute the quality traits (Panchali G. 2009, Babu *et al.*, 2012, Chandan Kumar and Nilanjaya, 2014) [5, 3, 4].

In Karnataka around 50 per cent of the total rice area (14.50 lakh ha) is under rainfed condition in which around 3.0 lakhs hectare area is under transplanted high rainfall situation. 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 per cent adaptation of high yielding varieties in the state of Karnataka and 73 per cent 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 aromatic short grain varieties/hybrids suitable to this region. Keeping in view an attempt has been made to find out the genetic variability for characters of economic importance and rice genotypes suited for this climatic condition.

Material and Methods

Five genotypes (IET 21759 (HPR 2603) VL 221/RP 2421//IR 53915-29-2-3-2-1, IET 21765 (UPRI 2008-20) WAS 57-B-B-17-3-1 and IET 21766 (VL 31348) Ch-4/ BL 122) including National check (Vivekdhan 62) and Regional check (HPR 2143) varieties were evaluated during *Kharif* season from 2010 to 2012 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 X 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, panicle length, number of panicles per hill, grain and straw yield were recorded at appropriate stage. Five random competitive plants excluding border ones were selected from each row in each replication to record observations on ten characters viz., days to 50 per cent flowering, days plant height, panicle length (cm), grain and straw yield, were recorded and mean values were subjected for statistical analysis. The data for each character were analyzed independently as well as pooled over years by using standard statistical procedure (Panse and Sukhatme, 1978).

Table 1: Performance of rice genotypes for grain yield and its component traits under heavy rainfall hilly situation

Genotypes	50 % Flowering				Plant height (cm)				Panicle Length (cm)				Grain Yield (Kg ha-1)				Straw Yield (Kg ha-1)			
	2010	2011	2012	Mean	2010	2011	2012	Mean	2010	2011	2012	Mean	2010	2011	2012	Mean	2010	2011	2012	Mean
IET 21759	89	93	88	90	102.6	106.8	101.5	103.6	19.5	20.2	19.3	19.6	4050	4213	4009	4091	8933	9294	8843	9023
IET 21765	88	92	88	89	095.5	099.4	094.6	096.5	22.9	23.8	22.7	23.1	3040	3163	3009	3071	8203	8534	8120	8286
IET 21766	85	89	84	86	102.2	106.3	101.2	103.2	19.1	19.9	18.9	19.3	3436	3575	3401	3471	8570	8916	8484	8657
HPR 2143	87	91	86	88	086.8	090.3	085.9	087.6	19.6	20.4	19.4	19.8	3336	3471	3302	3370	9548	9934	9452	9645
Vivekdhan 62	85	88	84	85	120.5	125.4	119.3	121.7	18.6	19.3	18.4	18.8	3701	3850	3663	3738	8934	9295	8844	9024
Mean	87	90	86	88	101.5	105.6	100.5	102.5	19.9	20.7	19.7	20.1	3513	3654	3477	3548	8838	9195	8748	8927
CV				4.66				5.75				13.33				8.66				5.136
			SEm±	CD (0.05)			SEm±	CD (0.05)			SEm±	CD (0.05)			SEm±	CD (0.05)			SEm±	CD (0.05)
Fac A			0.195	0.418			0.260	0.558			0.267	0.573			2.308	4.951			2.170	4.655
Fac B			0.252	0.541			0.336	0.721			0.345	0.74			2.980	6.392			2.802	6.010
A X B			0.436	NS			0.582	NS			0.598	NS			5.161	11.07			4.853	10.41

Results and Discussion

The pooled analysis of genotypes over the three years showed the IET 21759 showed consistent superior performance under shallow low land conditions of Sirsi location under high rainfall (> 2400 mm annual) western ghat region of Karnataka State. Days to 50 percent flowering differed significantly among genotypes tested, maximum days taken was recorded by IET 21759 in 89 days in 2010, 93 days in 2011, 88 days in 2012. Plant height showed significant difference among genotypes is all three years. Mean maximum plant height of 120.5, 125.4 and 119.3 was recorded in 2010, 2011 and 2012 respectively in Vivekdhan 62. Panicle length differed significantly among genotypes in all three tested years, maximum panicle length of 23.1 cm was recorded in IET 21765 followed by HPR 2143 over three years. Grain yield and straw yield varied significantly among genotypes in all three years of test. Maximum grain yield of 4091, 3738 and 3471 Kg ha^{-1} recorded in IET 21759, Vivekdhn 62 and IET 21766 and straw yield of 9645, 9024 and 9023 HPR 2143, Vivekdhn 62 and IET 21759 respectively (Table 1).

IET 21759 high yielding with cold tolerance showed superiority over checks for productivity with desirable quality parameters hence this genotype may be suitable for heavy rainfall hilly regions of Karnataka State.

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