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Trombay Konkan Khara (IET 30185) Rice Variety Suitable for Coastal Saline Soils in Maharashtra State

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Abstract

Trombay Konkan Khara (IET-30185) has high yielding rice variety having semi dwarf stature and non-lodging, mid late duration (125 to 130 days), long slender grain type, 37.68% increase over best check variety Panvel 2 in Station trial. It recorded 15.50% yield advantage over overall mean of four years over best check Panvel 2 in Maharashtra state coordinated trial under coastal saline soil condition. Trombay Konkan Khara rice variety developed by Khar Land Research Station, Panvel and Bhabha Atomic Research Centre (BARC), Trombay, Mumbai with an average yield of 3.5 to 4.0 t/ha. Trombay Konkan Khara (IET-30185) is evolved from a cross between CSR 27 / Dwarf mutant of CSR 27. Trombay Konkan Khara (IET-30185) has good milling (64.46%), head rice recovery (62.56%) and translucent kernel type indicating superior grain quality of rice variety.

Keyword: Trombay Konkan Khara, mid late variety, long slender grains, coastal saline soils, dwarf mutant of CSR 27

Introduction

Soil salinity negatively affects agricultural production worldwide. More than 800 million hectares of land globally are salt-affected, including both saline and sodic soils, which represent more than 6% of the world's total land area. In India, 6.73 million ha are under salt-affected area. Rice is considered salt-sensitive as it is not efficient in controlling the influx of Na^+ through the roots, leading to a rapid accumulation of toxic concentrations in above-ground parts. The problem of salinity has been addressed through better management practices and the introduction of salt-tolerant varieties in affected areas. The Maharashtra state has 720 km of coastal length with 54 creeks. It comprises the districts of Palghar, Thane, Raigad, Ratnagiri and Sindhudurg. The coastal saline soils occur in these districts due to periodical inundation of cultivable land by creek/sea water during high tides. As per the master plan of development of coastal saline soils of Maharashtra the total area under saline soils in five districts of Konkan is estimated to be 65,465 ha. The high-yielding stress-tolerant rice varieties are expected to provide a yield advantage of about 2 t ha^{-1} on these soils. Thus, genetic improvement of salt tolerance in rice appears to be economically feasible and a promising strategy for maintaining stable rice production globally. Accordingly, the efforts were made to develop and release the Trombay Konkan Khara to fulfill the requirement of fine grain type, mid late duration, high yielding rice variety for the farmers of the Konkan region of Maharashtra state in collaboration with BARC, Mumbai.

Trombay Konkan Khara (IET - 30185) is semi dwarf stature and non-lodging, mid late duration (125 to 130 days), long slender grain type, 37.68% increase over best variety check Panvel 2 in Station trial, 15.50% yield advantage on overall mean of four years over check Panvel 2 in Maharashtra state coordinated trial for Kharland (**Table 1 and Figure 1**).

Table 1: Grain Yield (Kg/ha) summary performance of rice culture BARCKKV 16 from *Kharif* 2013 to 2021

Name of Trial	Year	Locations	ECe BARCKKV 16	Grain yield (kg/ha)		
				PNL-2 (Local Check)	% increase over checks	
1. Station Trial						
IVT	2013	01	6.0	3786	2645	43.13
AVT	2014	01	6.0	3398	2572	32.11
Weighted mean/Total		**02**		**3592**	**2609**	**37.68**
2. Maharashtra Trials						
IVT-Kharland (Maharashtra)	2016	03	-	4618	4185	10.4
IVT-Kharland Maharashtra)	2017	03	-	3683	2803	**31.39**
AVT-Kharland (Maharashtra)	2018	02	-	3559	3278	8.6
AVT-Kharland (Maharashtra)	2019	02	-	2556	2215	15.4
Weighted mean/Total		**10**	**-**	**3698**	**3203**	**15.5**
3. AICRIP Trial						
CSTVT	2021	3	**4416**	Bhoothnath (Coastal Salinity check)	3264	
				CSR 10 (Salinity check)	2801	
				FL 478 (Salt tolerant check)	3179	
4. Agronomical trial						
	2021		4088		3511	**16.43**
5. Adaptive trials						
Adaptive	2021	18	-	3847.2	3320.6	**15.85**

Figure 1: Field view of Trombay Konkan Khara (IET-30185) rice variety

Trombay Konkan Khara (IET-30185) rice culture has recorded 15.85 per cent increase in grain yield over check Panvel 2 in Adaptive trials conducted on farmer's field during the year *kharif* 2021. Trombay Konkan Khara rice culture has recorded more than 35.29 per cent, 57.65 per cent and 38.91 per cent increase in grain yield over salinity check varieties Bhuthnath, CSR 10 and FL 478 in AICRIP IVT-CSTVT during the year *kharif* 2021.

Trombay Konkan Khara (IET-30185) having good milling (64.46%), head rice recovery (62.56%), amylose content (22.93%) and translucent kernel type indicating superior grain quality of rice variety BARCKKV 16 (**Figure 2**), moderately resistant to stem borer, moderately resistant to BLB disease, high in grain protein content (9.16%), average grain yield 3.5 to 4.0 t/ha under moderate coastal saline soils. (**Tables 2 and 3**).

Table 2: Pest and disease reactions of BARCKKV-16

Designation		Stem Borer		Bacterial Leaf Blight		Leaf Blast	
	Year	Mean	Reaction	Mean	Reaction	Mean	Reaction
BARCKKV 16	2016	0	HR	2	MR	4.0	MS
Panvel 2 (ch)		0	HR	3	MR	3.7	MS
BARCKKV 16	2018	1.5	MR	2	MR	3.3	MS
Panvel 2 (ch)		1.5	MR	5	MS	4.0	MS
BARCKKV 16	2022	--	MR				

R: Resistant, S: Susceptible, MR: Moderately resistant, HS: Highly susceptible, HR: Highly Resistant, MS: Moderately susceptible

Table 3: Summary of grain quality characteristics of BARCKKV-16

Sl. No	Designation	Milling (%)	HRR (%)	Grain chalk	Aroma	WU (ml)	VER	ER	ASV	AC (%)	GC (mm)	GT (°C)	Protein (%)
1	BARCKKV-16	64.46	62.56	A	NS	300	4.25	1.48	4.0	22.93	65	**Intermediate** (70-74 °C)	**9.16***
2	PNL-2 (Ch.)	57.15	48.88	VOC	NS	360	4.25	1.56	4.0	26.85	56	Intermediate (70-74 °C)	4.89**

HRR: Head Rice Recovery, KL: Kernel length, KB: Kernel Breadth, L/B ratio: Length/Breadth, Grain chalk: Grain chalkiness, 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, SS: Short slender, A: Absent

The yield attributing characters and yield of Trombay Konkan Khara and Panvel-2 variety shown significant influence as a result of various spacing and nitrogen levels under coastal saline condition.

The growth, yield attributing characters and yield of BARCKKV16 was found to be statistically significant over Panvel-2 rice variety. The plant height (105.2 cm), number of tillers per panicle (11.64), number of panicles per sq. m (311.67), Panicle length (24.14), number of spikelets per panicle (141.22) and test weight (25.1) were also observed to be statistically significant over Panvel-2 rice variety. The grain and straw yields of BARCKKV16 were significantly highest (40.88 qha^{-1}) and (42.36 qha^{-1}), respectively. There was an increase in the grain (14.06%) and straw (7.17%) yield of BARCKKV 16 over Panvel-2 rice variety. The different spacing had shown a significant effect on growth and yield attributes characters *viz.,* plant height, number of tillers per panicle, number of panicles per sq.m, spikelet per panicle, test weight. The treatment having spacing of 20 x15 and 20 x 20 cm caused a significant enhancement in the spacing grain (38.26 and 38.08 q ha^{-1}) and straw (40.94 and 41.01 q ha^{-1}) yields. The treatment receiving application of 150 kg N/ha showed a significant enhancement in yield attributing characters. It also recorded significant grain (39.00 qha^{-1}) and straw yield (41.40 qha^{-1}). However, the lowest grain and straw yield was observed in the treatment receiving 50 kg N/ha. The interaction of variety and nitrogen levels showed significant increase in grain yield. The treatment receiving application of 150% N *i.e.,* 150 kg N ha^{-1} to the BARCKKV 16 rice culture recorded significantly higher grain yield than rest of interactions of nitrogen levels and variety combination.

Paddy Rice

Figure 2: Grain characters of Trombay Konkan Khara (IET-30185) rice variety