

Supplementary Material

Root traits and cellular level tolerance hold the key in maintaining higher spikelet fertility of rice under water limited conditions

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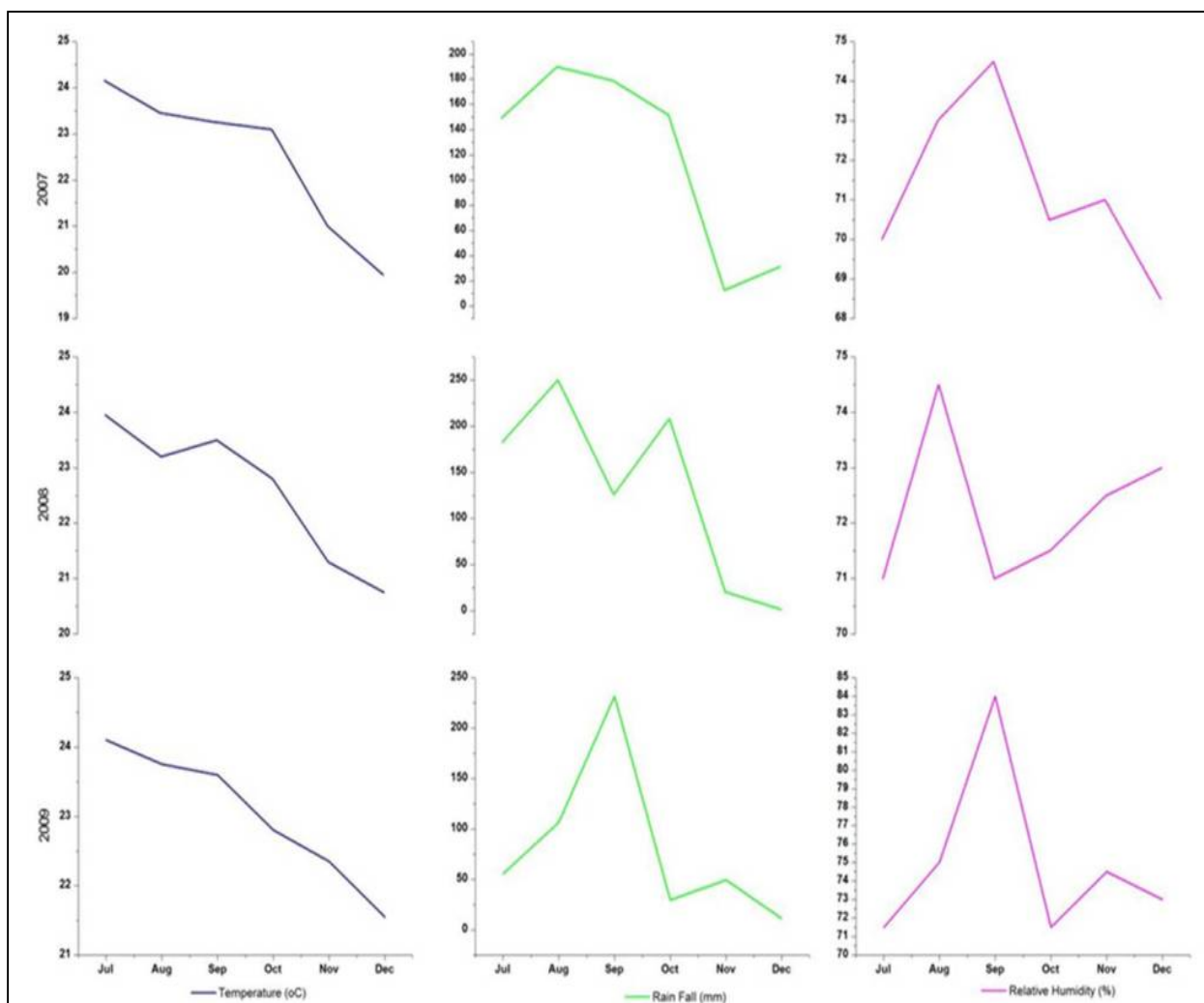


Fig. S1. Mean of a few important Meteorological parameters (Temperature, Rainfall and RH) during the three cropping seasons.

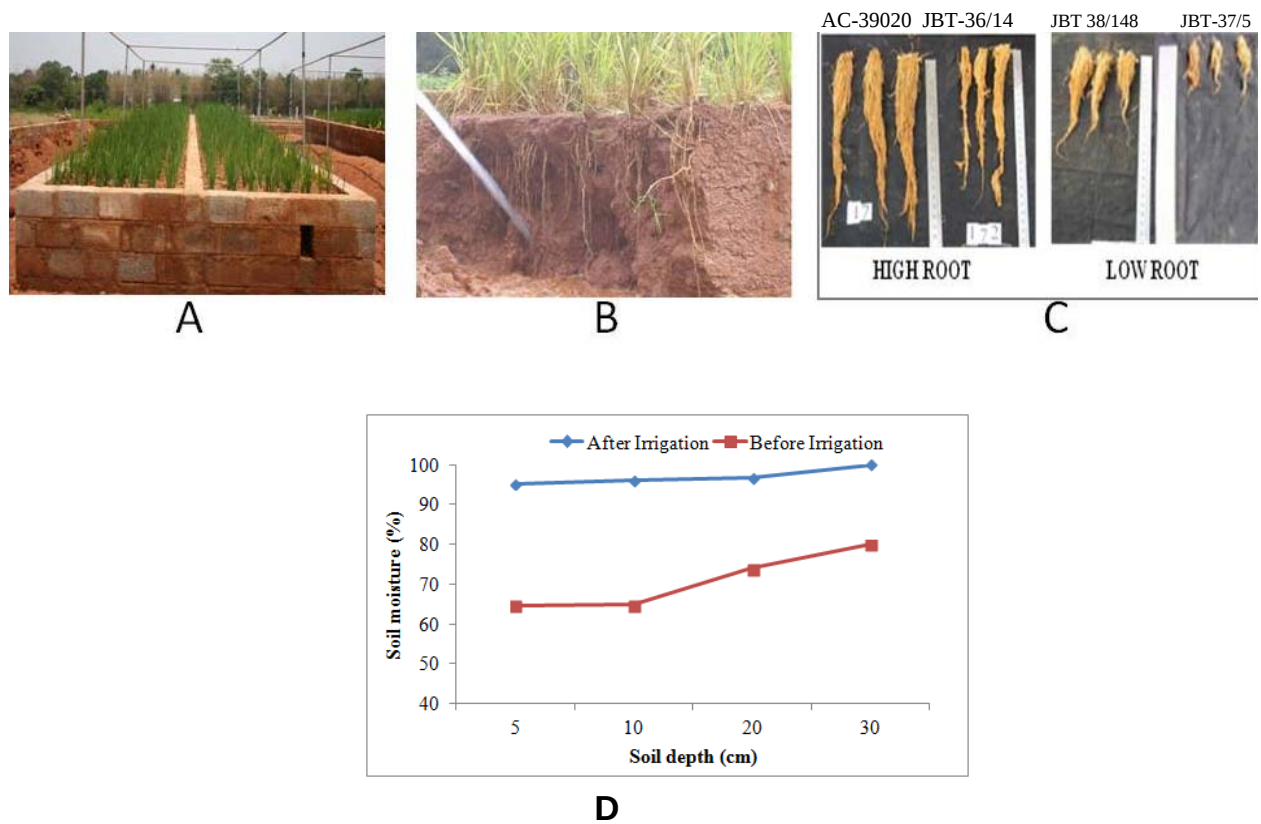


Fig. S2. Specially constructed Root structure for phenotyping root traits (A). The structures are dismantled and roots separated from soil using a strong jet of water (B). Genetic variability in root traits (C). Soil moisture level was measured in different depths using soil moisture probes to provide irrigation (D). (A) Root structures measuring of 5ft tall, 10ft wide and 60ft long, were built using cement bricks. An additional 5ft tall wall was built in the middle of the structure to make two halves, each 5ft wide. This provided additional strength to the structures. Soil was filled in these structures and compacted to mimic the real field conditions. Twenty days old seedlings were transplanted on root structures and plant population was maintained with 20 × 20 cm spacing. (B) On 75th day, side walls were dismantled to extract the roots carefully using jet of water to wash soil from roots and (C) variability was assessed.

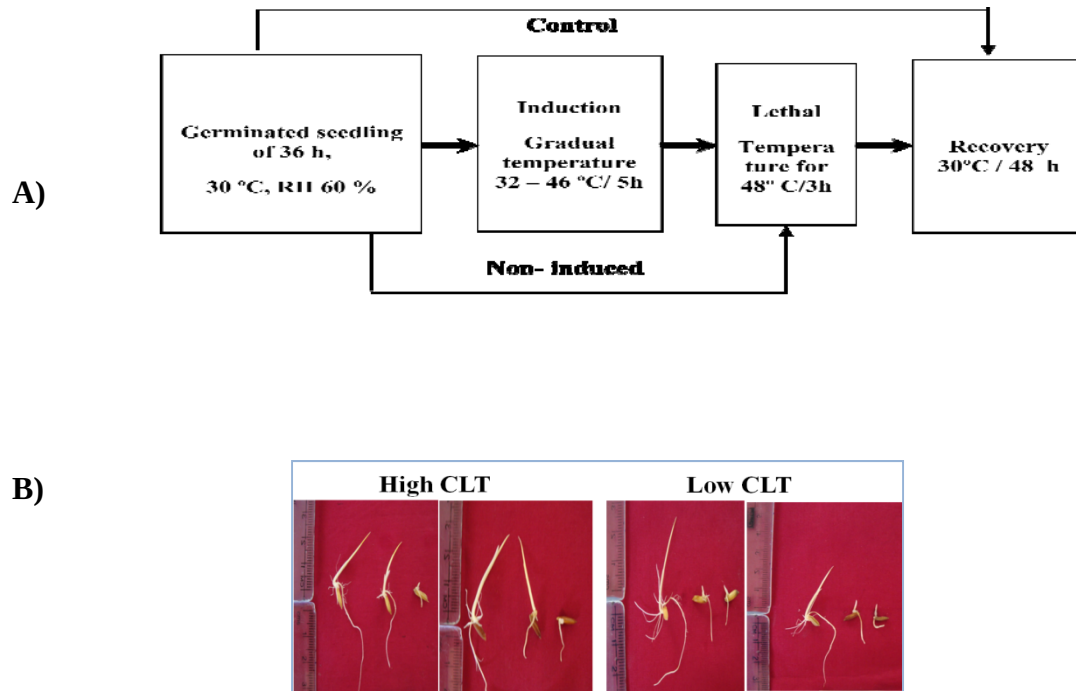


Fig. S3. The protocol followed to assess the cellular level tolerance of rice seedlings using temperature induction response (TIR) technique. (A) The general protocol: 36h old seedlings are induced by exposing them to a gradually increasing temperature regime from 32°C to 46°C over 5 hours. Induced seedlings as well as a set of un-induced seedlings are then transferred to a lethal temperature (48°C) for 3 hours. These seedlings are then transferred to the normal temperature (30°C) for recovery over the next 48 hours. Absolute control: seedlings maintained at 30°C temperature throughout the experiment. Recovery: temperature maintained at 30 °C for 48 h. (B) Genetic variability in induction response. The three seedlings in each panel represent absolute control (left), induced seedling (centre) and un-induced seedling (right). All the seedlings were taken after the 48 h of recovery growth.

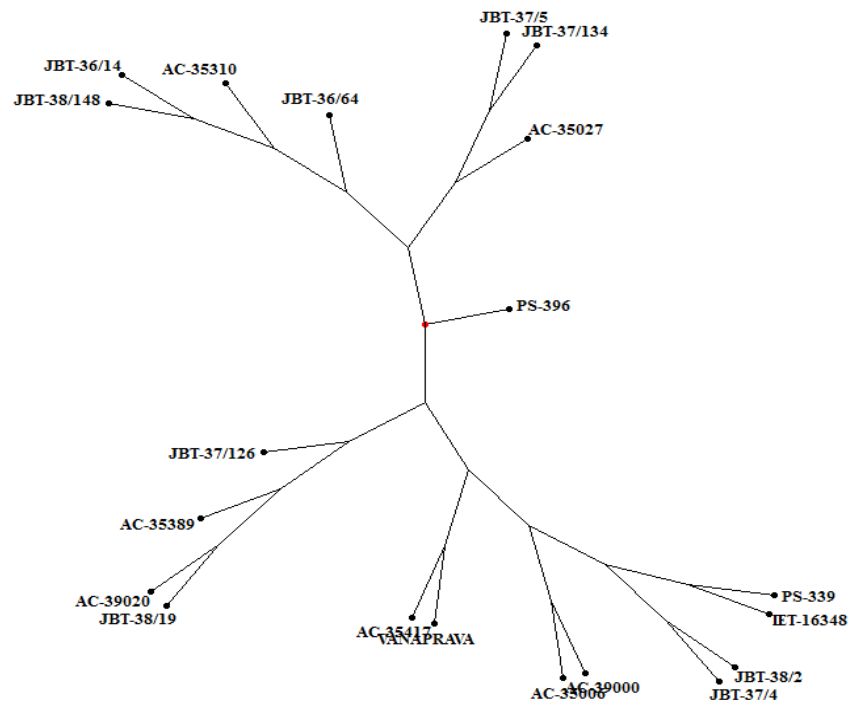


Fig. S4. Molecular diversity among 20 rice lines derived from UPGMA cluster analysis using Nei's coefficient between pairs using neighbor joining algorithm based on 124 genomic SSR markers.

Table S1. Correlation coefficient of root biomass, CLT parameters, and spikelet fertility among 20 genotypes.

RW: root dry weight, %RRG: Percent reduction in recovery growth, %Mor: percent Mortality, AGI: Actual Growth of induced seedlings during recovery, SF%: Spikelet Fertility in percentage and FC: Field Capacity. Significance levels are indicated: *, $P < 0.05$; **, $P < 0.01$. WL: Water limited, WW: Will water and AF: Aerobic field.

	RW	%RRG	% Mor	AGI	SF% (WL)	SF% (WW)
RW	-					
%RRG	-0.65**	-				
% Mor	-0.85**	0.83**	-			
AGI	ns	-0.78**	-0.62**	-		
SF% (WL)	0.87**	-0.72**	-0.95**	0.50*	-	
SF% (WW)	0.69**	-0.53*	-0.82**	ns	0.88**	-
SF% (AF)	0.82**	-0.69***	-0.92**	0.50*	0.98**	0.91**

Table S2. Variability in number of filled spikelets (NFS), number of chaffy spikelets (NCS), Total seed number (TSN) and spikelet fertility in percentage (SF %) under different water regimes among the selected contrasting genotypes of rice.

Values shown are mean per panicle. WL: Water limited, WW: Will water and AF: Aerobic condition.

Genotype	WL				WW				AF			
	NFS	NCS	TSN	SF %	NFS	NCS	TSN	SF %	NFS	NCS	TSN	SF %
HRB+HCLT												
AC-39000	78.00	21.67	99.67	78.3	82.33	8.67	91.00	90.5	87.67	17.00	104.67	83.8
AC-39020	80.33	29.00	109.33	73.5	145.00	24.67	169.67	85.5	95.33	37.33	132.67	71.9
JBT-36/14	88.67	27.67	116.33	76.2	92.33	15.33	107.67	85.8	90.00	25.67	115.67	77.8
AC-35006	90.00	31.67	121.67	74.0	103.00	20.00	123.00	83.7	90.00	33.00	123.00	73.2
AC-35310	73.33	16.00	89.33	82.1	140.67	14.33	155.00	90.8	62.00	12.33	74.33	83.4
IET-16348	98.00	34.33	132.33	74.1	103.00	25.67	128.67	80.1	86.67	30.00	116.67	74.3
AVG	84.7	26.7	111.4	76.3	111.1	18.1	129.2	86.0	85.3	25.9	111.2	77.4
HRB+LCLT												
AC-35389	82.33	29.67	112.00	73.5	88.00	20.00	108.00	81.5	90.00	30.67	120.67	74.6
JBT-38/19	64.00	30.67	94.67	67.6	79.67	23.67	103.33	77.1	64.33	28.67	93.00	69.2
PS-396	75.00	35.00	110.00	68.2	85.33	25.33	110.67	77.1	72.33	32.33	104.67	69.1
PS-339	58.67	27.67	86.33	68.0	63.00	18.33	81.33	77.5	61.33	27.67	89.00	68.9
AVG	70.0	30.8	100.8	69.3	79.0	21.8	100.8	78.3	72.0	29.8	101.8	70.4
LRB+HCLT												
JBT-36/64	72.67	109.33	182.00	39.9	83.67	59.00	142.67	58.6	33.33	53.67	87.00	38.3
JBT-37/4	57.33	58.67	116.00	49.4	138.00	66.00	204.00	67.6	31.33	29.67	61.00	51.4
VANAPRAVA	82.33	27.67	110.00	74.8	117.67	18.00	135.67	86.7	92.67	28.67	121.33	76.4
JBT-38/148	33.33	56.00	89.33	37.3	100.00	45.67	145.67	68.6	33.00	45.67	78.67	41.9
JBT-37/134	35.67	55.00	90.67	39.3	88.00	65.67	153.67	57.3	51.67	66.33	118.00	43.8
AC-35417	52.00	42.00	94.00	55.3	60.00	18.33	78.33	76.6	58.00	47.00	105.00	55.2
AVG	55.6	58.1	113.7	49.4	97.9	45.4	143.3	69.3	50.0	45.2	95.2	51.2
LRB+LCLT												
AC-35027	52.67	66.33	119.00	44.3	81.33	31.67	113.00	72.0	69.00	72.00	141.00	48.9
JBT-37/126	34.00	55.33	89.33	38.1	56.00	34.00	90.00	62.2	51.33	71.33	122.67	41.8
JBT-37/5	52.67	78.67	131.33	40.1	58.67	20.00	78.67	74.6	70.00	70.00	140.00	50.0
JBT-38/2	69.00	86.67	155.67	44.3	105.00	35.33	140.33	74.8	54.67	60.33	115.00	47.5
AVG	52.1	71.8	123.8	41.7	75.3	30.3	105.5	70.9	61.3	68.4	129.7	47.1

Note: High root biomass (HRB), Low root biomass (LRB), High cellular level tolerance (HCLT) and Low cellular level tolerance (LCLT).