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Supp. Table S1. Particle size distribution in granular substrates

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Granular substrate	Roundness (%)	Particle distribution	
		Size ( $\mu\text{m}$ )	% of total
Fine beads	80	> 420	0
		> 297	5
		> 210	85
		> 177	95
Coarse beads	80	> 1410	0
		> 841	5
		> 595	85
		> 250	95
Sand	-	> 710	0
		> 500	40
		> 425	56
		> 300	83.5
		< 300	16.5

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Supp. Table S2. Accuracy of RSA traits using a ground truth model

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Traits	Percent error
Depth (mm)	5.03
Total length (mm)	11.85
Width (mm)	8.77
Median root number	5.65
Convex area (mm <sup>2</sup> )	6.67

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Supp. Table S3. Significant difference between granular substrates for each cultivar.  
 Tukey HSD was used to compare least square means.

Trait	Level	- Level	p-Value
Diameter	Azucena,Fine beads	Azucena,Sand	1
	Azucena,Coarse beads	Azucena,Fine beads	0.9992
	Azucena,Coarse beads	Azucena,Sand	0.8683
	Basmati 217,Fine beads	Basmati 217,Coarse beads	0.0004
	Basmati 217,Fine beads	Basmati 217,Sand	<.0001
	Basmati 217,Coarse beads	Basmati 217,Sand	0.1648
	Bala,Fine beads	Bala,Coarse beads	0.9971
	Bala,Fine beads	Bala,sand	0.7086
	Bala,Coarse beads	Bala,sand	1
	Caiapo,Fine beads	Caiapo,sand	0.0101
	Caiapo,Coarse beads	Caiapo,Fine beads	1
	Caiapo,Coarse beads	Caiapo,sand	0.0006
	CO39,Fine beads	CO39,Coarse beads	0.9999
	CO39,Fine beads	CO39,sand	0.9832
	CO39,Coarse beads	CO39,sand	1
	IR64,Fine beads	IR64,sand	0.6509
	IR64,Coarse beads	IR64,Fine beads	0.8863
	IR64,Coarse beads	IR64,sand	0.0002
	Moroberekan,Fine beads	Moroberekan,Coarse beads	0.9999
	Moroberekan,Fine beads	Moroberekan,Sand	0.0223
	Moroberekan,Coarse beads	Moroberekan,Sand	0.5808
	Swarna,Fine beads	Swarna,Coarse beads	1
	Swarna,Fine beads	Swarna,Sand	0.0003
	Swarna,Coarse beads	Swarna,Sand	0.0139

Depth			
	Azucena,Coarse beads	Azucena,Sand	1
	Azucena,Fine beads	Azucena,Sand	0.8842
	Azucena,Fine beads	Azucena,Coarse beads	1
	Bala,Fine beads	Bala,Coarse beads	0.9277
	Bala,Fine beads	Bala,Sand	1
	Bala,Sand	Bala,Coarse beads	1
	Basmati 217,Fine beads	Basmati 217,Coarse beads	0.0001
	Basmati 217,Fine beads	Basmati 217,Sand	0.6418
	Basmati 217,Sand	Basmati 217,Coarse beads	0.2878
	Caiapo,Coarse beads	Caiapo,Sand	0.0002
	Caiapo,Coarse beads	Caiapo,Fine beads	1
	Caiapo,Fine beads	Caiapo,Sand	0.0082
	CO39,Fine beads	CO39,Coarse beads	1
	CO39,Sand	CO39,Coarse beads	<.0001
	CO39,Sand	CO39,Fine beads	<.0001
	IR64,Fine beads	IR64,Coarse beads	0.3769
	IR64,Sand	IR64,Coarse beads	0.1142
	IR64,Sand	IR64,Fine beads	1
	Moroberekan,Fine beads	Moroberekan,Coarse beads	0.9995
	Moroberekan,Fine beads	Moroberekan,Sand	<.0001
	Moroberekan,Sand	Moroberekan,Coarse beads	0.9998
	Swarna,Fine beads	Swarna,Coarse beads	0.9998
	Swarna,Fine beads	Swarna,Sand	<.0001
	Swarna,Sand	Swarna,Coarse beads	1

## Total length

Azucena,Coarse beads	Azucena,Sand	1
Azucena,Fine beads	Azucena,Sand	0.9653
Azucena,Fine beads	Azucena,Coarse beads	1
Bala,Fine beads	Bala,Coarse beads	0.9816
Bala,Sand	Bala,Coarse beads	0.8637
Bala,Sand	Bala,Fine beads	<.0001
Basmati 217,Fine beads	Basmati 217,Coarse beads	0.9441
Basmati 217,Fine beads	Basmati 217,Sand	1
Basmati 217,Sand	Basmati 217,Coarse beads	1
Caiapo,Coarse beads	Caiapo,Sand	0.3893
Caiapo,Fine beads	Caiapo,Sand	<.0001
Caiapo,Fine beads	Caiapo,Coarse beads	0.1972
CO39,Coarse beads	CO39,Fine beads	0.0884
CO39,Coarse beads	CO39,Sand	0.9467
CO39,Sand	CO39,Fine beads	0.9999
IR64,Fine beads	IR64,Coarse beads	0.2708
IR64,Fine beads	IR64,Sand	0.9998
IR64,Sand	IR64,Coarse beads	0.9345
Moroberekan,Coarse beads	Moroberekan,Sand	0.9993
Moroberekan,Fine beads	Moroberekan,Sand	0.9984
Moroberekan,Fine beads	Moroberekan,Coarse beads	<.0001
Swarna,Coarse beads	Swarna,Sand	0.9997
Swarna,Coarse beads	Swarna,Fine beads	<.0001
Swarna,Fine beads	Swarna,Sand	1

Width			
	Azucena,Fine beads	Azucena,Coarse beads	1
	Azucena,Sand	Azucena,Coarse beads	0.8607
	Azucena,Sand	Azucena,Fine beads	0.9998
	Bala,Fine beads	Bala,Coarse beads	0.9994
	Bala,Sand	Bala,Coarse beads	0.0011
	Bala,Sand	Bala,Fine beads	0.4058
	Basmati 217,Fine beads	Basmati 217,Coarse beads	0.2012
	Basmati 217,Fine beads	Basmati 217,Sand	0.9998
	Basmati 217,Sand	Basmati 217,Coarse beads	0.8999
	Caiapo,Fine beads	Caiapo,Coarse beads	0.0382
	Caiapo,Fine beads	Caiapo,Sand	0.3162
	Caiapo,Sand	Caiapo,Coarse beads	<.0001
	CO39,Coarse beads	CO39,Fine beads	0.9946
	CO39,Sand	CO39,Fine beads	0.3627
	CO39,Sand	CO39,Coarse beads	0.9994
	IR64,Fine beads	IR64,Coarse beads	<.0001
	IR64,Fine beads	IR64,Sand	0.2215
	IR64,Sand	IR64,Coarse beads	0.4455
	Moroberekan,Fine beads	Moroberekan,Coarse beads	1
	Moroberekan,Sand	Moroberekan,Coarse beads	0.9909
	Moroberekan,Sand	Moroberekan,Fine beads	1
	Swarna,Coarse beads	Swarna,Fine beads	<.0001
	Swarna,Sand	Swarna,Fine beads	0.1216
	Swarna,Sand	Swarna,Coarse beads	0.1134

## Convex area

Azucena,Fine beads	Azucena,Coarse beads	0.8294
Azucena,Fine beads	Azucena,Sand	1
Azucena,Sand	Azucena,Coarse beads	1
Bala,Fine beads	Bala,Coarse beads	0.914
Bala,Sand	Bala,Coarse beads	0.0791
Bala,Sand	Bala,Fine beads	1
Basmati 217,Fine beads	Basmati 217,Coarse beads	0.0223
Basmati 217,Fine beads	Basmati 217,Sand	0.9127
Basmati 217,Sand	Basmati 217,Coarse beads	0.9203
Caiapo,Coarse beads	Caiapo,Sand	0.4444
Caiapo,Fine beads	Caiapo,Sand	0.0002
Caiapo,Fine beads	Caiapo,Coarse beads	0.6555
CO39,Coarse beads	CO39,Fine beads	0.814
CO39,Sand	CO39,Fine beads	0.0185
CO39,Sand	CO39,Coarse beads	0.9719
IR64,Fine beads	IR64,Coarse beads	<.0001
IR64,Fine beads	IR64,Sand	0.7971
IR64,Sand	IR64,Coarse beads	0.104
Moroberekan,Fine beads	Moroberekan,Coarse beads	0.9996
Moroberekan,Sand	Moroberekan,Coarse beads	0.9935
Moroberekan,Sand	Moroberekan,Fine beads	<.0001
Swarna,Coarse beads	Swarna,Fine beads	<.0001
Swarna,Sand	Swarna,Fine beads	0.7336
Swarna,Sand	Swarna,Coarse beads	0.5144

Median root number			
	Azucena,Coarse beads	Azucena,Sand	1
	Azucena,Fine beads	Azucena,Sand	0.9991
	Azucena,Fine beads	Azucena,Coarse beads	1
	Bala,Coarse beads	Bala,Sand	1
	Bala,Fine beads	Bala,Sand	1
	Bala,Fine beads	Bala,Coarse beads	1
	Basmati 217,Coarse beads	Basmati 217,Sand	0.9156
	Basmati 217,Coarse beads	Basmati 217,Fine beads	1
	Basmati 217,Fine beads	Basmati 217,Sand	1
	Caiapo,Coarse beads	Caiapo,Sand	1
	Caiapo,Fine beads	Caiapo,Sand	0.979
	Caiapo,Fine beads	Caiapo,Coarse beads	0.9983
	CO39,Coarse beads	CO39,Fine beads	0.1545
	CO39,Coarse beads	CO39,Sand	0.7901
	CO39,Sand	CO39,Fine beads	1
	IR64,Coarse beads	IR64,Sand	0.9967
	IR64,Coarse beads	IR64,Fine beads	1
	IR64,Fine beads	IR64,Sand	1
	Moroberekan,Coarse beads	Moroberekan,Sand	0.6723
	Moroberekan,Coarse beads	Moroberekan,Fine beads	1
	Moroberekan,Fine beads	Moroberekan,Sand	0.9997
	Swarna,Coarse beads	Swarna,Sand	0.489
	Swarna,Coarse beads	Swarna,Fine beads	0.8852
	Swarna,Fine beads	Swarna,Sand	1



## Crown root number

Azucena,Coarse beads	Azucena,Fine beads	1
Azucena,Sand	Azucena,Fine beads	0.5855
Azucena,Sand	Azucena,Coarse beads	0.6212
Bala,Fine beads	Bala,Coarse beads	1
Bala,Sand	Bala,Coarse beads	0.4024
Bala,Sand	Bala,Fine beads	0.8307
Basmati 217,Coarse beads	Basmati 217,Fine beads	1
Basmati 217,Coarse beads	Basmati 217,Sand	1
Basmati 217,Sand	Basmati 217,Fine beads	1
Caiapo,Fine beads	Caiapo,Coarse beads	1
Caiapo,Sand	Caiapo,Coarse beads	1
Caiapo,Sand	Caiapo,Fine beads	1
CO39,Coarse beads	CO39,Sand	1
CO39,Coarse beads	CO39,Fine beads	1
CO39,Fine beads	CO39,Sand	1
IR64,Coarse beads	IR64,Fine beads	1
IR64,Sand	IR64,Fine beads	1
IR64,Sand	IR64,Coarse beads	1
Moroberekan,Fine beads	Moroberekan,Coarse beads	1
Moroberekan,Sand	Moroberekan,Coarse beads	0.9999
Moroberekan,Sand	Moroberekan,Fine beads	1
Swarna,Coarse beads	Swarna,Fine beads	0.9999
Swarna,Coarse beads	Swarna,Sand	1
Swarna,Sand	Swarna,Fine beads	1

## Root biomass

Azucena,Fine beads	Azucena,Coarse beads	0.3101
Azucena,Sand	Azucena,Coarse beads	<.0001
Azucena,Sand	Azucena,Fine beads	0.0011
Basmati 217,Fine beads	Basmati 217,Coarse beads	1
Basmati 217,Sand	Basmati 217,Coarse beads	1
Basmati 217,Sand	Basmati 217,Fine beads	1
Bala,Coarse beads	Bala,Fine beads	1
Bala,Sand	Bala,Fine beads	0.0063
Bala,Sand	Bala,Coarse beads	0.0231
Caiapo,Coarse beads	Caiapo,Sand	1
Caiapo,Fine beads	Caiapo,Sand	1
Caiapo,Fine beads	Caiapo,Coarse beads	1
CO39,Coarse beads	CO39,Fine beads	1
CO39,Sand	CO39,Fine beads	1
CO39,Sand	CO39,Coarse beads	1
IR64,Coarse beads	IR64,Fine beads	1
IR64,Sand	IR64,Fine beads	0.9903
IR64,Sand	IR64,Coarse beads	1
Moroberekan,Fine beads	Moroberekan,Coarse beads	0.0724
Moroberekan,Fine beads	Moroberekan,Sand	1
Moroberekan,Sand	Moroberekan,Coarse beads	0.281
Swarna,Fine beads	Swarna,Coarse beads	1
Swarna,Sand	Swarna,Coarse beads	1
Swarna,Sand	Swarna,Fine beads	1

## Shoot biomass

Azucena,Coarse beads	Azucena,Fine beads	0.8774
Azucena,Coarse beads	Azucena,Sand	1
Azucena,Sand	Azucena,Fine beads	0.9992
Basmati 217,Coarse beads	Basmati 217,Fine beads	0.0033
Basmati 217,Coarse beads	Basmati 217,Sand	0.904
Basmati 217,Sand	Basmati 217,Fine beads	0.7826
Bala,Coarse beads	Bala,Fine beads	0.3492
Bala,Sand	Bala,Fine beads	0.0642
Bala,Sand	Bala,Coarse beads	1
Caiapo,Coarse beads	Caiapo,Fine beads	0.2205
Caiapo,Sand	Caiapo,Fine beads	0.1611
Caiapo,Sand	Caiapo,Coarse beads	1
CO39,Coarse beads	CO39,Fine beads	0.0424
CO39,Coarse beads	CO39,Sand	0.9961
CO39,Sand	CO39,Fine beads	0.9835
IR64,Coarse beads	IR64,Fine beads	0.5508
IR64,Sand	IR64,Fine beads	0.428
IR64,Sand	IR64,Coarse beads	1
Moroberekan,Coarse beads	Moroberekan,Fine beads	0.2673
Moroberekan,Sand	Moroberekan,Fine beads	0.1331
Moroberekan,Sand	Moroberekan,Coarse beads	1
Swarna,Coarse beads	Swarna,Fine beads	0.7785
Swarna,Sand	Swarna,Fine beads	0.0008
Swarna,Sand	Swarna,Coarse beads	0.6435

Supp. Table S4. Least square means and connecting letters reports between simulated soils for each trait.

Tukey HSD was used to compare least square means. Levels not connected by the same letter are significantly different.

Trait	Cultivar	Granular substrate	Least square mean	Standard error	Connecting letters																					
Diameter	Basmati 217	Fine beads	0.354	0.011	A																					
	Swarna	Fine beads	0.348	0.015	A	B																				
	Caiapo	Coarse beads	0.342	0.016	A	B	C																			
	Caiapo	Fine beads	0.326	0.016	A	B	C	D																		
	Swarna	Coarse beads	0.325	0.014	A	B	C	D																		
	Moroberekan	Fine beads	0.321	0.016	A	B	C	D	E																	
	Azucena	Coarse beads	0.298	0.014	A	B	C	D	E	F																
	Moroberekan	Coarse beads	0.292	0.016	A	B	C	D	E	F	G															
	IR64	Coarse beads	0.276	0.015		B	C	D	E	F	G	H														
	Azucena	Fine beads	0.267	0.016			C	D	E	F	G	H														
	Bala	Fine beads	0.256	0.016				D	E	F	G	H	I													
	CO39	Fine beads	0.255	0.016				D	E	F	G	H	I													
	Basmati 217	Coarse beads	0.254	0.017				D	E	F	G	H	I													
	Azucena	Sand	0.254	0.014				D	E	F	G	H	I													
	Swarna	Sand	0.247	0.014					E	F	G	H	I													
	Moroberekan	Sand	0.235	0.015						F	G	H	I	J												
	Caiapo	Sand	0.233	0.016						F	G	H	I	J												
	CO39	Coarse beads	0.228	0.016						F	G	H	I	J												
	IR64	Fine beads	0.227	0.017						F	G	H	I	J												
	Bala	Coarse beads	0.224	0.013							G	H	I	J												
	CO39	Sand	0.215	0.016							G	H	I	J												
	Bala	Sand	0.205	0.014								H	I	J												
	Basmati 217	Sand	0.181	0.014									I	J												
	IR64	Sand	0.172	0.014										J												

Depth										
	Moroberekan	Fine beads	88.863	5.936	A					
	Moroberekan	Sand	87.587	5.141	A					
	Caiapo	Coarse beads	84.477	4.598	A					
	Swarna	Fine beads	82.246	5.141	A	B				
	CO39	Sand	80.413	5.936	A	B				
	Azucena	Fine beads	79.580	5.936	A	B				
	Swarna	Sand	78.893	5.141	A	B				
	Caiapo	Fine beads	78.678	4.847	A	B				
	Moroberekan	Coarse beads	77.340	5.936	A	B	C			
	CO39	Fine beads	76.296	5.141	A	B				
	CO39	Coarse beads	76.077	5.141	A	B				
	Swarna	Coarse beads	73.935	3.754	A	B				
	Bala	Fine beads	72.454	5.141	A	B	C	D		
	Azucena	Coarse beads	71.465	5.936	A	B	C	D	E	
	IR64	Sand	69.993	4.384	A	B	C	D	E	
	IR64	Fine beads	69.055	5.496	A	B	C	D	E	
	Bala	Sand	66.286	4.598	A	B	C	D	E	
	Basmati 217	Fine beads	64.820	5.141	A	B	C	D	E	
	Azucena	Sand	61.450	5.936	A	B	C	D	E	
	Bala	Coarse beads	59.070	4.033		B	C	D	E	
	Caiapo	Sand	48.881	5.141			C	D	E	F
	IR64	Coarse beads	48.328	4.598				D	E	F
	Basmati 217	Sand	48.203	4.033					E	F
	Basmati 217	Coarse beads	31.514	3.754						F

Total length	Caiapo	Fine beads	379.024	22.219	A						
	CO39	Coarse beads	353.295	23.566	A	B					
	Moroberekan	Fine beads	333.885	27.212	A	B	C				
	Moroberekan	Coarse beads	330.729	27.212	A	B	C				
	Azucena	Fine beads	322.926	27.212	A	B	C	D			
	IR64	Fine beads	300.985	25.193	A	B	C	D	E		
	Bala	Sand	291.455	21.078	A	B	C	D	E		
	Azucena	Coarse beads	290.745	27.212	A	B	C	D	E		
	Bala	Fine beads	283.571	23.566	A	B	C	D	E		
	CO39	Sand	281.841	27.212	A	B	C	D	E		
	Caiapo	Coarse beads	281.110	21.078	A	B	C	D	E		
	Moroberekan	Sand	280.037	23.566	A	B	C	D	E		
	IR64	Sand	259.591	20.097		B	C	D	E		
	Swarna	Coarse beads	253.501	17.210		B	C	D	E		
	Azucena	Sand	249.645	27.212	A	B	C	D	E	F	
	Swarna	Fine beads	245.441	23.566		B	C	D	E	F	
	CO39	Fine beads	236.587	23.566		B	C	D	E	F	
	Bala	Coarse beads	229.693	18.487			C	D	E	F	
	Swarna	Sand	214.198	23.566			C	D	E	F	G
	IR64	Coarse beads	200.547	21.078				D	E	F	G
	Caiapo	Sand	190.207	23.566				D	E	F	G
	Basmati 217	Fine beads	182.893	23.566					E	F	G
	Basmati 217	Sand	150.737	18.487						F	G
	Basmati 217	Coarse beads	124.694	17.210							G

Width	IR64	Fine beads	44.031	2.618	A															
	Azucena	Sand	41.129	2.828	A	B														
	Moroberekan	Sand	39.634	2.449	A	B														
	Moroberekan	Fine beads	36.525	2.828	A	B	C	D												
	Caiapo	Fine beads	36.329	2.309	A	B	C													
	Azucena	Fine beads	35.871	2.828	A	B	C	D												
	IR64	Sand	33.490	2.088	A	B	C	D	E											
	Moroberekan	Coarse beads	33.283	2.828	A	B	C	D	E	F										
	Azucena	Coarse beads	32.296	2.828	A	B	C	D	E	F										
	Bala	Sand	31.264	2.190		B	C	D	E	F										
	CO39	Sand	30.829	2.828	A	B	C	D	E	F	G									
	Caiapo	Sand	26.289	2.449			C	D	E	F	G	H								
	CO39	Coarse beads	25.576	2.449			C	D	E	F	G	H	I	J						
	IR64	Coarse beads	25.023	2.190			C	D	E	F	G	H		J						
	Swarna	Sand	24.871	2.449			C	D	E	F	G	H	I	J	K					
	Caiapo	Coarse beads	24.310	2.190				D	E	F	G	H	I	J						
	Basmati 217	Fine beads	23.388	2.449				D	E	F	G	H	I	J	K					
	Bala	Fine beads	21.894	2.449					E	F	G	H	I	J	K					
	CO39	Fine beads	19.933	2.449						F	G	H	I	J	K					
	Basmati 217	Sand	19.292	1.921							G	H	I	J	K					
	Bala	Coarse beads	17.533	1.921								H	I	J	K					
	Swarna	Coarse beads	14.522	1.788									I		K					
	Basmati 217	Coarse beads	13.719	1.788											K					
	Swarna	Fine beads	13.141	2.449										I	J	K				

Convex area	Moroberekan	Sand	2352.833	144.705	A														
	Moroberekan	Fine beads	2307.364	167.091	A	B													
	Azucena	Fine beads	2131.981	167.091	A	B	C												
	IR64	Fine beads	2015.905	154.696	A	B	C												
	Moroberekan	Coarse beads	1987.345	167.091	A	B	C	D											
	Caiapo	Fine beads	1928.559	136.429	A	B	C	D											
	CO39	Sand	1905.398	167.091	A	B	C	D											
	Azucena	Sand	1859.964	167.091	A	B	C	D	E										
	Azucena	Coarse beads	1596.211	167.091	A	B	C	D	E	F									
	IR64	Sand	1556.424	123.405		B	C	D	E	F									
	CO39	Coarse beads	1492.576	144.705		B	C	D	E	F	G	H							
	Caiapo	Coarse beads	1453.675	129.428			C	D	E	F		H							
	Bala	Sand	1437.333	129.428			C	D	E	F	G	H							
	Swarna	Sand	1319.990	144.705			C	D	E	F	G	H	I						
	Bala	Fine beads	1211.801	144.705				D	E	F	G	H	I						
	Basmati 217	Fine beads	1084.319	144.705					E	F	G	H	I						
	CO39	Fine beads	1023.149	144.705						F	G	H	I	J					
	IR64	Coarse beads	940.466	129.428						F	G	H	I	J					
	Caiapo	Sand	910.182	144.705						F	G	H	I	J					
	Swarna	Coarse beads	834.823	105.677							G		I	J					
	Bala	Coarse beads	827.874	113.516							G	H	I	J					
	Swarna	Fine beads	825.135	144.705							G	H	I	J					
	Basmati 217	Sand	699.767	113.516									I	J					
	Basmati 217	Coarse beads	378.699	105.677															J



Median root number	CO39	Coarse beads	3.625	0.333	A
	Moroberekan	Coarse beads	3.483	0.385	A B
	Caiapo	Fine beads	3.308	0.314	A B
	Azucena	Fine beads	3.188	0.385	A B
	IR64	Coarse beads	3.163	0.298	A B
	Azucena	Coarse beads	3.008	0.385	A B
	Bala	Fine beads	2.972	0.333	A B
	Moroberekan	Fine beads	2.883	0.385	A B
	Swarna	Coarse beads	2.868	0.243	A B
	Bala	Coarse beads	2.848	0.261	A B
	IR64	Fine beads	2.782	0.356	A B
	Caiapo	Coarse beads	2.660	0.298	A B
	Basmati 217	Coarse beads	2.577	0.243	A B
	Bala	Sand	2.535	0.298	A B
	IR64	Sand	2.516	0.284	A B
	Caiapo	Sand	2.475	0.333	A B
	CO39	Sand	2.438	0.385	A B
	Azucena	Sand	2.404	0.385	A B
	Basmati 217	Fine beads	2.231	0.333	A B
	Moroberekan	Sand	2.209	0.333	A B
	CO39	Fine beads	2.072	0.333	A B
	Swarna	Fine beads	1.978	0.333	A B
	Basmati 217	Sand	1.833	0.261	B
	Swarna	Sand	1.738	0.333	B

Crown root number	Bala	Sand	13.200	0.683	A						
	Bala	Fine beads	10.900	0.836	A	B	C				
	CO39	Coarse beads	10.846	0.733	A	B					
	Bala	Coarse beads	10.722	0.623	A	B	C	D			
	CO39	Fine beads	10.000	0.836	A	B					
	Azucena	Sand	9.786	0.706	A	B	C	D	E		
	CO39	Sand	9.750	0.935	A	B	C	D	E	F	
	IR64	Sand	8.938	0.661		B	C	D	E	F	
	IR64	Coarse beads	8.643	0.706		B	C	D	E	F	G
	Moroberekan	Sand	8.182	0.797		B	C	D	E	F	G
	IR64	Fine beads	8.000	0.836		B	C	D	E	F	G
	Azucena	Coarse beads	8.000	0.683		B	C	D	E	F	G
	Moroberekan	Fine beads	7.900	0.836		B	C	D	E	F	G
	Azucena	Fine beads	7.727	0.797			C	D	E	F	G
	Basmati 217	Coarse beads	7.118	0.641		B	C	D	E	F	G
	Caiapo	Sand	7.000	0.935		B	C	D	E	F	G
	Basmati 217	Sand	6.875	0.661				D	E	F	G
	Caiapo	Fine beads	6.800	0.683				D	E	F	G
	Moroberekan	Coarse beads	6.786	0.706				D	E	F	G
	Caiapo	Coarse beads	6.636	0.797				D	E	F	G
	Swarna	Coarse beads	6.412	0.641					E	F	G
	Basmati 217	Fine beads	6.348	0.551				D	E	F	G
	Swarna	Sand	5.273	0.797						F	G
	Swarna	Fine beads	5.167	0.763							G

Root biomass	Genotype	Substrate	Yield (g)	Standard Error (SE)	Significance Group
	Azucena	Sand	0.016	0.001	A
	Caiapo	Fine beads	0.016	0.001	A B
	Caiapo	Coarse beads	0.015	0.001	A B C
	Moroberekan	Fine beads	0.015	0.001	A B C D
	Caiapo	Sand	0.015	0.001	A B C D
	Moroberekan	Sand	0.014	0.001	A B C D E
	IR64	Sand	0.014	0.001	A B C D E
	IR64	Coarse beads	0.013	0.001	A B C D E F
	IR64	Fine beads	0.011	0.001	B C D E F G
	Azucena	Fine beads	0.011	0.001	C D E F G H I
	Bala	Sand	0.010	0.001	D E F G I
	Moroberekan	Coarse beads	0.010	0.001	D E F G I
	Basmati 217	Sand	0.010	0.001	E F G H I
	Basmati 217	Fine beads	0.009	0.001	F G H I J
	Basmati 217	Coarse beads	0.009	0.001	F G H I J
	Swarna	Sand	0.007	0.001	G H I J
	CO39	Sand	0.007	0.001	G H I J
	Swarna	Fine beads	0.007	0.001	G H I J
	Azucena	Coarse beads	0.007	0.001	G H I J
	Bala	Coarse beads	0.006	0.001	H I J
	CO39	Coarse beads	0.006	0.001	H I J
	CO39	Fine beads	0.006	0.001	H I J
	Swarna	Coarse beads	0.006	0.001	H I J
	Bala	Fine beads	0.005	0.001	J



Supp. Table S5. Cultivar dry weight in gel  
Values shown are means and standard deviation of at least 10 plants.

Substrate	Cultivar	Root (mg)	Shoot (mg)	Root/Shoot
1X gel	Azucena	5.3 ± 1.9	12.7 ± 4.2	0.4 ± 0.2
	Basmati 217	7.9 ± 1.4	9.0 ± 1.8	0.9 ± 0.3
	Bala	4.9 ± 0.5	11.4 ± 1.4	0.4 ± 0.1
	Caiapo	13.9 ± 2.6	7.7 ± 1.9	1.9 ± 0.5
	CO39	4.7 ± 1.2	13.3 ± 2.6	0.4 ± 0.1
	IR64	11.4 ± 2.2	5.5 ± 1.8	2.4 ± 1.0
	Moroberekan	6.9 ± 2.4	13.2 ± 2.7	0.5 ± 0.1
	Swarna	3.8 ± 0.6	9.8 ± 3.0	0.4 ± 0.2
6X gel	Azucena	6.2 ± 2.0	14.1 ± 1.9	0.4 ± 0.2
	Basmati 217	6.0 ± 2.2	6.8 ± 1.8	0.9 ± 0.3
	Bala	4.5 ± 1.0	10.9 ± 3.4	0.5 ± 0.2
	Caiapo	16.2 ± 1.4	7.1 ± 1.6	2.4 ± 0.8
	CO39	5.5 ± 0.9	15.7 ± 2.3	0.4 ± .01
	IR64	11.0 ± 2.8	6.2 ± 2.1	2.0 ± 0.9
	Moroberekan	7.2 ± 2.3	12.0 ± 2.1	0.6 ± 0.1
	Swarna	3.8 ± 0.8	10.5 ± 1.1	0.4 ± 0.1