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*(Oryza sativa L.)*

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*(Oryza sativa L.)*

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PSBR- A

PSBR-C88

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C84

K+/Na+

K+ Na+

K+/Na+

Na+

PSBR-C88

Na+

K+

(Clarkson, 1980)

(Tangy, 1990)

(Ansari et al., 2001)

(Mer et al., 2000)

(Poustini, 1995)

( / )

(Yeo &

$\text{Na}^+$   
 $\text{Na}^+/\text{K}^+$

(Abdolzadeh &

.Flowers, 1986)

.Saffari, 2002)

(Lang et al., 2001a)

(Lang et al., 2001b)

( )

(Ekis et al.,

.2003)

(Munns et al., 2006)

(Moradi, 2002; Lang et al., 2001a)

(Moradi et al., 2003; Davenport et al.,

.2005)

:

(Munns, 2002)

(Rayama et al., 2001)

(Gulzar & Ajmalkhan, 2001)

$\text{K}^+/\text{Na}^+$

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(Sung shim, 2005)

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PSBR-C88

(FAO, 2003)

PSBR-C84 ( ) A-7963 (IR58025/IR60819R)

( )

/

(Agricultural

.statistics, 2006)

PSBR-C84 . A /19R

) IR58025/IR80819R

PSBR-C88

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(IRRI)

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(Saadati

.& Milani, 1998)

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MSTAT-C

Path Analysis

NaOH (744-METROHM ) pH  
/ HCl

:(Glenn et al., 1996)

$$PG = Ni/N \times \dots = PG$$

$$= Ni$$

$$= N$$

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PSBR-C88

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:(Soltani et al., 2001)

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$$Vg = \frac{n_1 t_1 + n_2 t_2 + n_3 t_3 + \dots + n_n t_n}{N}$$

$$= V_g$$

$$= n_1$$

$$= n_n$$

$$= t_n \dots ( )$$

$$( )$$

A

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(2001) Alam et al. (1999) Howard et al.

(2005) Jamil et al. (1994) Main et al.

K<sup>+</sup> Na<sup>+</sup>

K<sup>+</sup>/Na<sup>+</sup>

K<sup>+</sup> Na<sup>+</sup>

(GNVEA PSP7 )

Na<sup>+</sup>

( / )

SAS

PSBR-C88

Na<sup>+</sup>

( $r = \cdot / \text{q} \text{e}^{**}$ )  
( )

$-\beta \quad \alpha$

(Zahidn et al., 2002)

(1990) Ujwala et al. .

(2001) Anuradha et al. (2003) Vardhini et al.

( )

/ ) PSBR-C88

Howard et al. .

(2001) Alam et al. (1999)

(2001) Soltani et al.

Jamil et al. (2004) Cerboncini et al. .

(2005)

Puppala et al. .

(1999)

( )

							(df)	(S.O.V)	(V)
/ **	/ **	/ **	/ **	/ **	/ **	/ **			(S)
/ **	/	/ **	/ **	/ **	/ **	/ **		(V×S)	
/	/	/	/	/	/	/			( )

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( )	( )	( )	( )	( )	( )	dsm <sup>-1</sup>				
/ ghi	/ gh-n	/ efg	/ g-k	/ jklm	/ ef-i	/ a-f				
/ pqr	/ n-x	/ qrst	/ h-s	/ tu-xy	/ jklm	/ g-k				
/ opqr	/ tu-z[	/ klmn	/ j-t	/ wx-z[ ]^-	/ stuv	/ o-r				
/ wx	/ \ ]^-	/ xyz[	/ u-z	/ ]^-	/ vwxy	/ r-t				
/ i-n	/ m-w	/ fg	/ q-x	/ lm-pq	/ abcd	/ ab				
/ n-q	/ k-u	/ o-s	/ g-m	/ jklm	/ efgh	/ d-i				
/ q-t	/ o-y	/ r-v	/ g-m	/ qr-v	/ fg hi	/ b-h				
/ rst	/ w-z[ \ ]	/ n-r	/ p-w	/ qr-u	/ jklmn	/ ghijk				
/ bc	/ b	/ def	/ e-i	/ jkl	/ ghij	/ a-f				
/ h-l	/ g-l	/ klmmo	/ f-j	/ tu-z[ \ ]	/ ijklm	/ e-j				
/ qrst	/ s-z	/ qrst	/ g-p	/ st-x	/ opqrs	/ lmno				
/ qrst	/ u-z[ \ ]	/ n-s	/ g-o	/ [ ]^-	/ tuvw	/ qrs				
/ def	/ cde	/ fgh	/ h-s	/ rs-w	/ pqrs	/ opqr				
/ l-q	/ j-rs	/ p-t	/ l-t	/ vw-z[ ]^	/ pqrs	/ opqr				
/ xy	/ -	/ yz[	/ v-z	/ z[ ]^-	/ wxyz	/ vwx				
/ x	/ z[ ]^-	/ z[ \ ]	/ xyz[	/ ^-	/ wxyz	/ wxy				
/ i-n	/ lm-v	/ fgh	/ j-st	/ pq-t	/ pqrs	/ lmno				
/ qrs	/ lm-v	/ t-x	/ g-p	/ tu-yz	/ mn-q	/ fghijk				
/ h-l	/ g-m	/ klmn	/ g-q	/ vw-xz[ ]^	/ qr-u	/ mnop				
/ vmx	/ ^-	/ s-w	/ t-y	/ ^-	/ wxyz	/ tuv				
/ de	/ e-j	/ c	/ g-p	/ jkl	/ cdef	/ abcde				
/ n-q	/ jk-rs	/ rstuv	/ g-q	/ qr-u	/ hi-l	/ cdefgh				
/ t-w	/ v-z[ \ ]	/ v-z[	/ q-x	/ xy-z[ ]^-	/ rstu	/ opqr				
/ u-x	/ xy-z[ \ ]	/ \	/ n-v	/ \ ]^-	/ uvwx	/ tuv				
/ nopq	/ op-xy	/ k-o	/ o-v	/ l-q	/ no-r	/ h-l				
/ hijk	/ ij-qr	/ f-i	/ s-x	/ n-s	/ op-r	/ m-p				
/ x	/ ]^-	/ xyz[	/ w-z[	/ yz[ ]^-	/ wxyz	/ uvw				
/ x	/ [ ]^-	/ [ \ ]	/ w-z[	/ ]^-	/ xyz	/ tuv				
/ j-no	/ op-xy	/ fgh	/ i-s	/ h-k	/ rstu	/ mnop				
/ pqrs	/ pq-xy	/ n-s	/ p-w	/ q-v	/ rstu	/ opqr				
/ uvwx	/ ]^-	/ q-u	/ x-z[	/ w-z[ ]^-	/ wxyz	/ vwx				
/ xy	/ -	/ w-z[	/ [	/ -	/ z[	/ yz				

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/	a	/	a	/	a	/	bc	/	b	/	abc	/	abc	
/	de	/	bc	/	ghij	/	bcde	/	defg	/	abcd	/	a	PSBR-C88
/	ghij	/	gh-m	/	ghij	/	bedef	/	efgh	/	ef-i	/	abc	
/	efg	/	f-k	/	de	/	g-r	/	ghij	/	hijk	/	abcde	

( )	( )	( )	( )	( )	( )	dsm <sup>4</sup>								
/	m-pq	/	jk-st	/	qrst	/	g-l	/	r-v	/	pqrs	/	klm	
/	stu	/	x-z[ ]^	/	rstu	/	k-l	/	t-z[	/	no-r	/	vwx	
/	xy	/	-	/	yz[	/	v-z	/	xyz[ ]^-	/	wxyz	/	xy	
/	yz	/	'a	/	m-q	/	\	/	^-	/	[	/	yz	

/	k-op	/	jk-rs	/	lm-p	/	c-h	/	klm	/	hijk	/	mnop	A
/	opqr	/	qr-xy	/	lm-p	/	j-t	/	m-r	/	wxyz	/	mnop	
/	tuv	/	yz[ ]^	/	r-v	/	r-x	/	]^-	/	wxyz	/	uvwxy	
/	z	/	'a	/	t-y	/	\	/	^-	/	yz[	/	z	

/	hi-m	/	hi-op	/	ijkl	/	f-j	/	defg	/	defg	/	ab-g	PSBR-C84
/	ij-n	/	ij-pq	/	klm	/	g-n	/	klm	/	opqrs	/	mnop	
/	uvwxyz	/	[ ]^-	/	u-z	/	l-t	/	v-z[ ]^	/	qrst	/	pqr	
/	yz	/	'a	/	v-z[	/	z[	/	w-z[ ]^-	/	vw-y	/	stu	

/	b	/	bcd	/	b	/	c-h	/	c	/	ab	/	a	
/	opqr	/	no-wx	/	o-s	/	o-v	/	j-n	/	pqrs	/	klmn	
/	nopq	/	rs-y	/	ijkl	/	o-v	/	k-o	/	pqrs	/	no-r	
/	qrst	/	x-z[ ]^	/	klmn	/	yz[	/	u-z[ ]	/	stuv	/	tuv	

/	def	/	cdef	/	fg	/	bcd	/	de	/	bcde	/	a	
/	ghi	/	defg	/	k-p	/	b	/	klm	/	ij-m	/	ab-g	
/	ghijk	/	efghij	/	k-o	/	h-s	/	o-s	/	klmno	/	hi-l	
/	nopq	/	op-xy	/	k-no	/	m-u	/	r-w	/	rstu	/	nopq	

/	efg	/	efgh	/	fg	/	e-i	/	cd	/	hijk	/	abcd	
/	hijkl	/	ef-i	/	qrst	/	b-g	/	def	/	ij-m	/	cd-gh	
/	hijkl	/	hi-o	/	hijk	/	g-p	/	ijk	/	pqrs	/	ij-m	
/	fgh	/	efghi	/	ghij	/	g-n	/	k-p	/	qrst	/	ijkl	

/	a	/	a	/	a	/	a	/	a	/	a	/	a	
/	cd	/	bcde	/	d	/	g-l	/	cde	/	bcde	/	ab	
/	ij-mn	/	gh-mn	/	k-o	/	d-i	/	f-i	/	efgh	/	abc	
/	ij-mn	/	hi-no	/	k-n	/	gh-q	/	j-n	/	lmnop	/	fg-jk	

(γ)	(ε)	(δ)	(φ)	(ζ)	(η)	(ι)	
						1	1
					1	./96**	2
				1	./81**	./8. **	3
			1	./79**	./86**	./92**	4
		1	./81**	./92**	./82**	./8. **	5
	1	./9. **	./94**	./85**	./83**	./87**	6
1	./99**	./92**	./9. **	./85**	./8. **	./84**	7

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(2003) Siosemardeh et al. .

PSBR-C88

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( )

(1986) Munns et al.

(2000) Mer et al.

(2004) Diego et al.

Na<sup>+</sup>

Na<sup>+</sup>

K<sup>+</sup>/Na<sup>+</sup>

( )

) PSBR-C88

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(2002) Nuran et al. (2001) Alam et al. .

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(2000) Zahid et al.

Ca<sup>2+</sup>

( )

/ /

Na<sup>+</sup>

Akita et al. (2003) Ekis et al.

(1990)

( ) (P < 0.01)

/ ) (

/ )

(

(2000) Zeng & Shannon

Munns (2004) Diego et al. .

(2002)

Mer et al. ( )

(1986) Munns et al. (2000)



( / )

( ) ( )  
(2005) Jamil et al.

( / / )  
)  
( / /

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PSBR-C84

Diego (2003) Ekis et al. (1990) Akita & Cabuslay  
(2004) et al.

(2000) Dionisio et al. (1990) Akita et al.  
(2004) Godfrey et al.

(1982) Janrdhan et al.

.(Schatchman, 1991)

.( )  
)

/ ) ( )  
/ ) PSBR-C88 ( )  
( )

( ) PSBR-C84 ( / )  
( )

PSBR-C84

Na<sup>+</sup>

/ / /  
/ / PSBR-C88

(2000) Mer (1985) Wais

/

( )

(1994) Wilkinson (1984) Veinberg et al.

( )

Na<sup>+</sup>

) ( )

(

Na<sup>+</sup>

)

( )

(

(2000) Mer et al. (2002) Moradi

(Main et al., 1994)

( )

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Shepherd

( )

(2000) Huang (2002) et al.

(2003) Siosemardeh et al. (2002) Moradi

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Na <sup>+</sup>							(df)	(S.O.V)
/ **	/ **	/ **	/ **	/ **	/ **	/ **		(V)
/ **	/ **	/ **	/ **	/ **	/ **	/ **		(S)
/ **	/ **	/ **	/ **	/ **	/ **	/ **		(V×S)
/	/	/	/	/	/	/		
/	/	/	/	/	/	/		( )

\*\* :

K <sup>+</sup> /Na <sup>+</sup>		K <sup>+</sup> /Na <sup>+</sup>		K <sup>+</sup>		K <sup>+</sup>		Na <sup>+</sup>		(S.O.V)
/ **	/ **	/ **	/ **	/ **	/ **	/ **	/ **	/ **	/ **	(V)
/ **	/ **	/ **	/ **	/ **	/ **	/ **	/ **	/ **	/ **	(S)
/ **	/ **	/ **	/ **	/ **	/ **	/ **	/ **	/ **	/ **	(V×S)
/	/	/	/	/	/	/	/	/	/	
/	/	/	/	/	/	/	/	/	/	( )

( )

CO<sub>2</sub>

) PSBR-C88

(Jamil et al., 2005; Popova et al., 1995)

( ) (P<0.01)

( )

/ ) ( / )  
) ( / /

( )

(2005) Jamil et al.

NaCl

(2000) Mer et al.

(1982) Janrdhan et al.

NaCl

(Croser et al., 2001; Pichoni et al., 2001)

(Na<sup>+</sup>)

Na<sup>+</sup> )  
 ) ( )  
 Na<sup>+</sup> ( )  
 PSBR-C88 Na<sup>+</sup> )  
 ( ) ( )  
 ( ) ( )  
 Na<sup>+</sup> ( )  
 Na<sup>+</sup> ( )

(1986) Rawson (2000) Mer et al.

*Aeluropus Lagopoides*

(Gulzar et al., 2001)

( )

( )

Na<sup>+</sup>

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( / / /

PSBR-C88

Na<sup>+</sup>

Na<sup>+</sup>

/ / )

(

(Na<sup>+</sup>)

(2001) Renault et al.

( )

(2004) Ashraf et al. (1999) Mehmet et al.

Cl<sup>-</sup> Na<sup>+</sup>

( )

Na<sup>+</sup>  
(Wang et al., 2006;

.Orooj et al., 2006)

(NSW, 2000)

- 
1. Exclusion mechanism
  2. efflux

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Na <sup>+</sup>												
( )	( )	( )	( )	( )	( )	( )	( )	( )	dsm <sup>-1</sup>			
z	/	cd-hi	/	gh-op	/	bcde	/	bcd	/	cde	/	mn-u
c	/	ef-lm	/	jkl-qr	/	ijklm	/	hijkl	/	h-m	/	no-u
rst	/	lm-st	/	pq-tu	/	op-tu	/	tu-z	/	r-y	/	lm-u
klmno	/	uv-y	/	pq-tu	/	wxyz[	/	z[\]^	/	x-z[\]^	/	no-u
z	/	hi-pq	/	de-ij	/	efgh	/	jk-o	/	i-p	/	bc-m
hijkl	/	fg-mn	/	gh-op	/	nopq	/	op-uv	/	st-z	/	fg-pq
hi	/	hi-op	/	de-kl	/	rs-yz	/	wx-z[\]	/	^-	/	cd-mn
pqrs	/	tu-x	/	de-jk	/	xyz[	/	\]^	/	z[\]^	/	bc-jk
z	/	bc	/	cd-hi	/	a	/	abc	/	bcd	/	qr-u
uvw	/	bcde	/	gh-op	/	fghi	/	fghi	/	f-j	/	stu
lmnopq	/	fg-mn	/	ef-mn	/	lmno	/	defg	/	i-n	/	rstu
d	/	pq-uv	/	hi-op	/	vwxyz[	/	v-z[\]	/	l-t	/	v
z	/	fg-n	/	ijk-pq	/	bcde	/	gh-k	/	efg	/	hi-pq
qrs	/	fg-no	/	mn-rs	/	ijk	/	jk-o	/	i-o	/	kl-tu
fg	/	lm-u	/	op-tu	/	nop-s	/	pq-w	/	k-s	/	de-op
klmno	/	wxyz	/	uvmx	/	uv-yz[	/	yz[\]	/	x-z[\]^	/	jk-tu
z	/	f-m	/	ij-qr	/	bcde	/	bcde	/	ab	/	bc-hi
rst	/	f-n	/	no-st	/	ijkl	/	ij-m	/	e-h	/	cde-o
b	/	op-v	/	no-st	/	rs-z[	/	qr-x	/	q-w	/	fg-pq
rstur	/	st-x	/	qr-uv	/	rs-yz[	/	uv-z[	/	u-z[	/	hi-r
z	/	op-uv	/	ef-mn	/	bcde	/	op-u	/	g-l	/	op-tu
y	/	gh-no	/	no-st	/	ghij	/	no-tu	/	i-m	/	pq-u
de	/	tu-wx	/	op-tu	/	st-yz[	/	w-z[\]	/	r-y	/	de-op
rstu	/	wxyz	/	pq-tu	/	[	/	^-`a	/	[\]^	/	hi-rs
z	/	cdef	/	gh-op	/	bcd	/	ab	/	a	/	bcd
wxy	/	jk-qr	/	mn-rs	/	mnop	/	lm-r	/	jk-r	/	cd-n
stuv	/	no-tu	/	hi-op	/	pq-uv	/	st-y	/	rs-y	/	bc-j
hi-lm	/	rs-x	/	mn-rs	/	z[	/	[\]^	/	v-z[\]	/	mn-u
z	/	cdefg	/	gh-op	/	bcd	/	abc	/	abc	/	g-q
lm-op	/	cd-jk	/	mn-rs	/	ghij	/	hi-l	/	i-n	/	j-u
de	/	qr-vm	/	qr-uv	/	qr-wx	/	xyz[\]	/	rs-x	/	tu
hij	/	xyz	/	vwx	/	z[	/	]^-	/	yz[\]^	/	u

Na <sup>+</sup>								dsm <sup>-1</sup>					
( )	( )	( )	( )	( )	( )	( )	( )						
z	/	a	/	a	/	abc	/	a	/	a	/	a	PSBR-C88
hi	/	bc	/	cd-gh	/	cdef	/	defg	/	def	/	bc-h	
a	/	fg-mn	/	fg-no	/	lmno	/	kl-o	/	lm-s	/	bcde	
ef	/	qr-vm	/	mn-rs	/	no-rs	/	rs-y	/	n-v	/	bcde	
z	/	ij-pq	/	cd-n	/	fghi	/	lm-p	/	ij-pq	/	ab	A
xy	/	yz	/	vwx	/	qr-wx	/	'ab'	/	\	/	vW	
op-s	/	[	/	x	/	yz[	/	b'	/	-'	/	wx	
p-s	/	z[	/	x	/	uw-z[	/	'ab'	/	-'	/	x	
z	/	a	/	b	/	ab	/	e-h	/	fghi	/	bc-i	PSBR-C84
y	/	lm-st	/	de-qr	/	klmn	/	rs-xy	/	tu-z	/	op-u	
ij-m	/	no-tu	/	jk-lm	/	qr-vw	/	st-y	/	uv-z[\	/	ef-q	
hijk	/	[	/	wx	/	z[	/	'ab'	/	]'^-	/	v	
z	/	bcde	/	cde	/	efgh	/	ij-n	/	ij-o	/	bc	PSBR-C84
rst	/	def-kl	/	cd-gh	/	ijklm	/	mn-s	/	kl-s	/	bc-fg	
tuvw	/	lm-st	/	mn-rs	/	vwxyz[	/	wx-[ ]	/	vw-z[ ]^	/	bc	
hijk	/	vwxy	/	rs-v	/	[	/	^-'a	/	x-z[ ]^	/	ab	
z	/	cd-gh	/	jk-rs	/	a	/	hi-l	/	fghij	/	bc-m	PSBR-C84
vw	/	ij-pq	/	lm-rs	/	hij	/	lm-q	/	ij-p	/	hi-rs	
no-s	/	st-x	/	rs-v	/	op-st	/	st-y	/	u-z[\	/	de-p	
de	/	wxyz	/	tu-x	/	z[	/	z[ ]^	/	u-z[	/	f-pq	
z	/	ab	/	cdef	/	abc	/	cdef	/	def	/	gh-q	PSBR-C84
rst	/	bc	/	cd-i	/	defg	/	f-k	/	gh-k	/	i-t	
c	/	fg-no	/	kl-rs	/	no-r	/	mn-t	/	kl-rs	/	b-kl	
wx	/	mn-u	/	gh-p	/	qr-y	/	w-z[ ]	/	pq-v	/	f-q	
z	/	bc	/	cd	/	lmno	/	q-y	/	o-v	/	ab	PSBR-C84
ef	/	bcde	/	cdefg	/	no-s	/	tu-z	/	u-z[\	/	b-i	
gh	/	kl-rs	/	jk-qr	/	st-z[	/	]'^	/	]'^	/	bc-f	
jk-n	/	pq-v	/	stuvw	/	z[	/	^-'a	/	yz[ ]^	/	bc-h	
z	/	cd-jk	/	bc	/	ab	/	f-j	/	fg-i	/	bc	PSBR-C84
no-rs	/	cd-ij	/	de-ij	/	ijklm	/	l-r	/	m-u	/	g-q	
no-r	/	tu-x	/	gh-p	/	tu-z[	/	w-z[ ]	/	w-z[ ]^	/	o-u	
mn-q	/	u-y	/	gh-p	/	[	/	]'^	/	yz[ ]^	/	p-u	

...

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( )	K <sup>+</sup> /Na	K <sup>+</sup> /Na	K <sup>+</sup>	K <sup>+</sup>	Na <sup>+</sup>	dsm <sup>-1</sup>
/ ef-k	/ bcd	/ c	fg-nop	klmno	z	
/ hi-op	/ i	/ j	fg-jk	klmno	wxy	
/ op-tu	/ i	/ hij	fg-kl	jklmn	ghij	
/ vwxy	/ i	/ j	bc	qr-xyz	vwxy	
/ ij-pq	/ h	/ f	[ \	d	z	
/ gh-no	/ i	/ j	]	^	de	
/ hi-op	/ i	/ j	rs-wx	st-z[	de	
/ rs-uv	/ i	/ j	\	] ^	c	
/ cdef	/ cde	/ b	cd-hi	de-h	z	
/ defg	/ i	/ ij	rs-wx	st-xy	vwxy	
/ gh-no	/ i	/ ij	vwxy	op-st	mn-q	
/ qr-uv	/ i	/ j	uv-y	w-z[	gh-i	
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/ jk-qr	/ i	/ j	rs-w	tu-z[	qrst	
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/	\	/	i	/	hij	mn-tu	d-h	k-o				
/	cdef	/	de	/	de	hi-pq	ef-j	z				
/	fg-m	/	i	/	hij	kl-qr	lm-q	ij-m				PSBR-C84
/	no-tu	/	i	/	ij	pq-tu	v-z[	l-p				
/	wxyz	/	i	/	ij	wxy	j-no	b				
/	ef-kl	/	b	/	c	bcde	b	z				
/	lm-st	/	i	/	hij	rs-x	op-x	xy				
/	uvwx	/	i	/	hij	cdef	d-g	uv-y				
/	xyz	/	i	/	j	e-jk	r-z[	rs-v				
/	bc	/	b	/	g	e-ij	g-kl	z				
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(2003) Jian- Kang (2002) Munns

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(1990) Akita et al. .

(2006) Sung et al. .

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(2005) Chen et al.

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(2006) Wang et al.

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(2004) Ashraf & Neilly

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(Poustini & Siosemardeh, 2004; Colmer et al., 2006)

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(2002) Moradi (Zabet et al., 2003)  $K^+/Na^+$

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(2002) James et al. (2005) Shani et al. Munns et al.

(2007) Moradi & Abdelbagi (1980) Kurth et al. (2006)

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(Husain et al., 2004; Munng et al., 2003)

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(1990) Amaranthath et al. .

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