

( )

\*

( // : // : )

( % )  
( )

.(Kafee et al., 2000)

.(Kafee et al., 2000)

.(Babalar & Pirmoradian, 2000)

(1995) Fukuyama et al. .  
(Ca- zeolite)

(Bialczyk et al., 2007)

(2005) Gull et al. .

(1998) Siddigi et al.

(Siddigi et al., 1998)

( )

(Barton et al., 2006)

(Dixon & Weed, 1998)

(1997) Kapetanios et al. .

(Delshad et al., 2006)

%

( )

(1996) Challinor et al.

EC . ± /

pH .

---

2. Split plot design

---

1. open system=Non recirculating systems

...

:

(mmol/L)	N	P	K	Ca	Mg	S	Cl
(N+)	/	/	/		/	/	
(N-)	/	/	/		/	/	/
(mg/L)	Na	Fe	Mn	Zn	Cu	Mo	B
(N )	(N+)	/	/	/	/	/	

(g/g) .  
 (mm/day) . ( / mg NH<sub>4</sub>/g z)  
 (cm<sup>2</sup>/day) .  
 (g/m<sup>2</sup>/day) .  
 (mg/m<sup>2</sup>/day) . (Wang et al., 2006)

) .  
 ( (WPCF,AWWA. Standard methods., 1989)

%) .  
 (Le Bot et al., 2001)  
 ) .(

( beril  
 // //

kjdale Tecator Analyzer  
 (1030)  
 .(Emami, 1996)

( ) (Leaf area meter model: DELTA-T,  
 DEVICES LTD)

(Standard methods: 4500-NH<sub>3</sub>-  
 C,1989)

(Spectrometer. uv/vis, Perkinelmer Lambda 201  
 USA.)

- 
- 2. Specific Leaf Ratio(SLR) :1997)
  - 3. leaf Weight Ratio(LWR)
  - 4. Stem Elongation Ratio(SER) (m<sup>2</sup>/m<sup>2</sup>) .
  - 5. Leaf Expansion Ratio(LER) (cm<sup>2</sup>/g) .
  - 6. Crop Growth Ratio(CGR)
  - 7. Net Assimilation Rate(NAR)

(Karimi & Azizi,

---

1. Leaf Area Index(LAI)

Tei et al.

(Wang et al., 2006)

(2002a&b)

SAS 6.12

(2000) Walker et al.

Excel

(Fukuyama et al., 1995)

LAI (%)  
 LER ( ) SLA ( )  
 ( )

(Kutuk et al., 2004)

CGR ( ) SER ( )  
 ( ) %

(Gul et al., 2005; Maloupa et al.,

- .1999; Gent, 2004)

beril

(cm <sup>2</sup> /g)	(cm <sup>2</sup> /day)	(m <sup>2</sup> /m <sup>2</sup> )
/ a	۱۰۶/۰۹a	۳/۳۶a*
۷۱/۴۰b	۶۷/۹۸b	۲/۲۳b

% \*

beril

(g/g)	(cm <sup>2</sup> /g)	(m <sup>2</sup> /m <sup>2</sup> )	(cm)
/ a	/ a	/ a	a / a*
/ a	/ a	/ b	/ a
/ a	/ a	/ C	/ b

+

(g/m <sup>2</sup> /day)	(mg/m <sup>2</sup> *day)	(cm <sup>2</sup> /day)	(mm/day)	(cm <sup>2</sup> /g)
/ a	/ a	/ a	/ a	/ a
/ a	/ a	/ b	/ a	/ b
/ b	/ a	/ c	/ b	/ b

% \*



	%		
		beril	
		(%)	
		/ b* (T1)	
		/ a (T2)	
		×	
		/ b N <sup>+</sup> × T1	
		/ a N <sup>+</sup> × T2	
		/ c N <sup>-</sup> × T1	
		/ c N <sup>-</sup> × T2	
		%	*
	EC	T1	=N <sup>-</sup> =N <sup>+</sup>
		T2	
beril (ppm)			
/ a*	N <sup>+</sup> × ZNH <sub>4</sub> +P		
/ b	N <sup>+</sup> × Z+P		
/ b	N <sup>+</sup> +P		
/ c	N <sup>-</sup> × ZNH <sub>4</sub> +P		
/ d	N <sup>-</sup> × Z+P		
/ d	N <sup>-</sup> +P		
=P	=ZNH <sub>4</sub> +P	=N <sup>-</sup>	=N <sup>+</sup>
		=Z+P	
	%		*

	beril		
	(ppm)		
	/ b* (T1)		
	/ a (T2)		
	%		*

( )

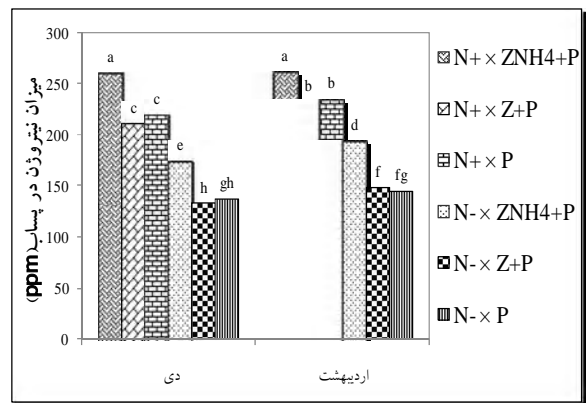
	beril		
	(ppm)		
	/ a* (N <sup>+</sup> )		
	/ b (N <sup>-</sup> )		
	/ a +		
	/ b		
	/ b		
	%		*

( )

% /  
 % /  
 (1999) Harland et al.

Gull et al. (2005) Caballero et al. (2005)  
 (2005) Mohammad et al. (2005)  
 (1996) Challinor et al.

(1999) Maloupa et al. (2008) Ayan et al. .



beril

=P

=N-

=N+

=ZNH<sub>4</sub>+P

=Z+P

beril

( )	( )
/ a +	/ a*
/ a	/ a
/ b	
%	*

LeBot et al. .

(2001)

( )

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