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(// : // :)

(%)
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.(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)

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.(Barton et al., 2006)

(Dixon & Weed, 1998)

(1997) Kapetanios et al. .

(Delshad et al., 2006)

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(1996) Challinor et al.

EC . ± /

pH .

(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)

(cm²/day)

(g/m²/day)

(mg/m²/day)

(Wang et al., 2006)

)

(WPCF,AWWA. Standard methods., 1989)

(Le Bot et al., 2001)

%

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beril

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kjdale Tecator Analyzer

(1030)

(Emami, 1996)

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

(Standard methods: 4500-NH₃-C,1989)

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

- 2. Specific Leaf Ratio(SLR)
 - 3. leaf Weight Ratio(LWR)
 - 4. Stem Elongation Ratio(SER)
 - 5. Leaf Expansion Ratio(LER)
 - 6. Crop Growth Ratio(CGR)
 - 7. Net Assimilation Rate(NAR)
- (m²/m²)
- (cm²/g)

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 ² /g)	(cm ² /day)	(m ² /m ²)
/ a	1.6/.9a	2/26a*
11/4.0b	67/91b	2/22b

% *

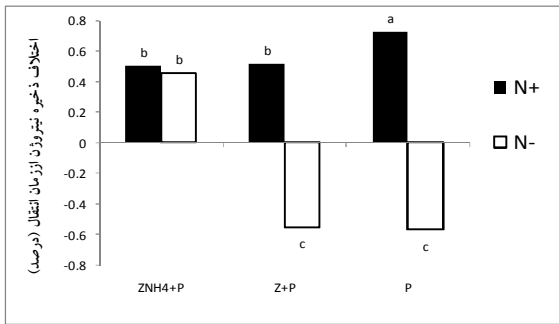
beril

(g/g)	(cm ² /g)	(m ² /m ²)	(cm)
/ a	/ a	/ a	a / a*
/ a	/ a	/ b	/ a
/ a	/ a	/ C	/ b

+

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

% *



pH

beril

=P

=ZNH₄+P

=N⁻

=Z+P

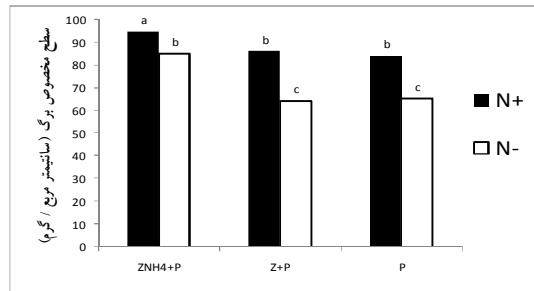
=N⁺

(Dixon & Weed, 1989; Greenwood

et al., 1991; gent et al., 2004)

()

(2007) Pisanu et al. (1986) Hartman et al.



beril

=N⁻

=N⁺

=ZNH₄+P

=Z+P

=P

()

%

beril

beril	
(%)	
/ b*	(T1)
/ a	(T2)
	×
/ b	N ⁺ × T1
/ a	N ⁺ × T2
/ c	N ⁻ × T1
/ c	N ⁻ × T2
%	
T1	T2
	=N ⁻
	=N ⁺ *

EC

beril	
(ppm)	
/ a*	N ⁺ × ZNH ₄ +P
/ b	N ⁺ × Z+P
/ b	N ⁺ +P
/ c	N ⁻ × ZNH ₄ +P
/ d	N ⁻ × Z+P
/ d	N ⁻ +P
%	
=P	=N ⁻
=ZNH ₄ +P	=Z+P
	=N ⁺ *

beril

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

()

beril

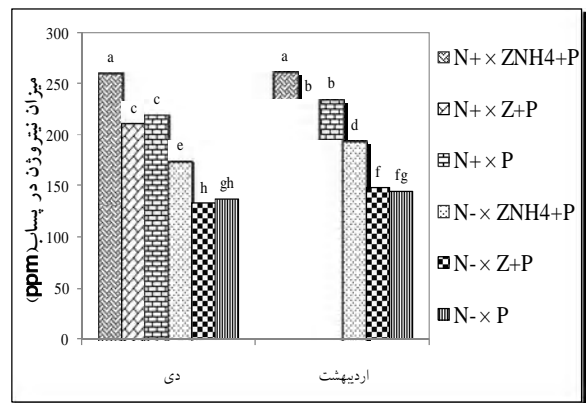
beril	
(ppm)	
/ a*	(N ⁺)
/ b	(N ⁻)
	+
/ a	
/ b	
/ b	
%	

()

...
 % /
 % /
 (1999) Harland et al.

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

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



beril

=P

=N-

=N+

=ZNH₄+P

=Z+P

beril

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

LeBot et al. .

(2001)

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