

( )

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pH

( )

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PPM

PPM

: : NO3:NH4

N03,

( )

NH4, K, Ca, Mg

F<sub>1</sub>

pH

( )

EC pH

EC.

( x x x )

EC

EC

NH4

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pH

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- 
1. Stock solution
  2. Macroelement
  3. Microelement

- 
1. Sugar Baby

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$$S_1 \rightarrow \frac{NH_4}{NH_4 + NO_3} = \frac{1}{7}$$

$$S_2 \rightarrow \frac{NH_4}{NH_4 + NO_3} = \frac{0}{6}$$

$$S_3 \rightarrow \frac{NH_4}{NH_4 + NO_3} = \frac{0.4}{6.4}$$

$$S_4 \rightarrow \frac{NH_4}{NH_4 + NO_3} = \frac{0.2}{6.2}$$

$$S_5 \rightarrow \frac{NH_4}{NH_4 + NO_3} = \frac{0.6}{6.6}$$

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MSTATC

pH

S<sub>5</sub>, S<sub>4</sub>, S<sub>3</sub>,

S<sub>2</sub>, S<sub>1</sub>

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/ S

( )

/ S

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$\text{NO}_3^-$ ,

$\text{NH}_4^+$

( )

$\text{NH}_4$

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( ) S

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%

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%

( ) (S )

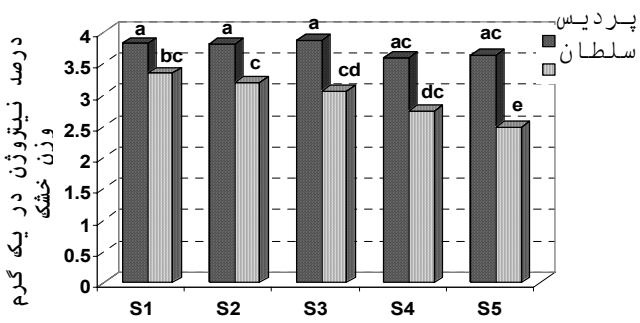
	( )	( )	( )	( )	( )	
	%	%	%	%	%	
S1	/	e	/	c	/	d
S2	/	a	/	a	/	a
S3	/	b	/	b	/	a
S4	/	c	/	b	/	b
S5	/	d	/	cb	/	c

( )

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/

( )



	( )	( )	( )	( )	( )
	(%)	(%)	(%)	(%)	(%)
S1	/ c	/ d	/ d	/ a	/ a
S2	/ a	/ a	/ a	/ a	/ d
S3	/ b	/ b	/ b	/ a	/ c
S4	/ c	/ c	/ c	/ b	/ b
S5	/ d	/ cd	/ c	/ b	/ b

( )	( )	( )	( )	( )	( )	( )
	**	**	**	**	**	**
*	/ ns	/ ns	/ ns	/ **	/ **	/ ns

S :

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S

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K<sub>2</sub>HPO<sub>4</sub> , KH<sub>2</sub>PO<sub>4</sub>

(H<sub>2</sub>PO<sub>4</sub><sup>-</sup> , HPO<sub>4</sub><sup>-</sup>)

%

( S )

H<sup>+</sup>

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( S )

.( )

%

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( S S )

( )

( S )

( )

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%

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## REFERENCES

N,P,K,EC

4. Adams L. & C. Ho. Panda.1998. Differential effect of artificial substrate and humidity on growth and Ca status of cucumber and tomato hydroponic culture. Acta. Hort. 401:4032-4044
5. Ben .U. & A. Kafkafi. 2002. Melons, cucumber and pepper fruit quality as affected by timing, duration and concentration of phosphate and nitrogen source in recycle hydroponic system .Department of Field Crops. Rehovot, 76100. Israel.
6. F.A.O.1990. Soilless culturer for horticultural crop production 46P.
7. Feigin. A. & M. Zwibel. 1998. The effect of ammonium nitrogen ratio in the nutrient solution on tomato and cucumber yield and qualities. Acta. Hort. 31.
8. Hassah. A. 2001. Hydroponics as an agriculture production system . Rirdic Publication. No. 141.

9. Sanchez. J. C. & F. Egea.1999. Hydroponic and mineral nutrition of cucumber on rockwool substrate. J. Amer. Soc. Hort. Sci. 110:1019-1030.
10. Sanovald – Villa. M,G. Alcantar –Gonzalez & J.L.Tiyado – toyyes. 1995. Use of ammonium in nutrient solutions. J. Plant Nutrition. 18. 1449-1457.
11. Santamario.P & A. Hartman. 1999. Effect of nitrogen form on growth, yield and ion composition of endive.J. Amer. Soc. Hort Sci.122:140-145.
12. Simonne.E. A. Simonne & L.Wills. 2001. Nitrogen source affects crunchiness but not lettuce yield and melon. Journal of Plant Nutrition. 24: 743-475.
13. Szymanska. M. & J. Molas. 2000. The cytotoxic influence of ammonium on *Cucumis sativus*. Acta. Hort. Plant Physiology. No.15:950-959.
14. Vertrate.D, R .Yorgen, V. Jody & V Frank. 1998. Determination of the uptake of [pt (NH<sub>3</sub>)<sub>4</sub>No<sub>3</sub>]<sub>2</sub> by cucumber plant. The Science of the Total Environment 218:153-160.
15. Vinit–Dunad. F, D. Epron & B. Alaoui–pierre.2002. Effect of copper on growth and on photosynthesis of mature and expanding leaves in cucumber plants. Plants Science 163: 53-58.
16. Zarvy. G, A. Varge & E. Ciseh.1997. Microanalytical investigation of xylem of cucumber by X-ray spectrometry in soilless culture. Microchemical Journal 55: 64-71.