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1. Solanaceae
 2. Cucurbitaceae

e-mail: delshad@ut.ac.ir

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Ca	/				/
Mg	/		/		/
NH ₄					
H		/			/
Total		/	/	/	/

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Fe	/
Mn	/
Zn	/
Cu	/
Mo	/
B	

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	mmol/L
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Ca	
Mg	
SO ₄	/
Cl	/
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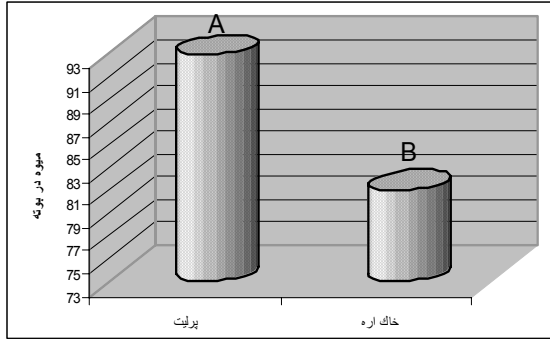
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K	/	/			/
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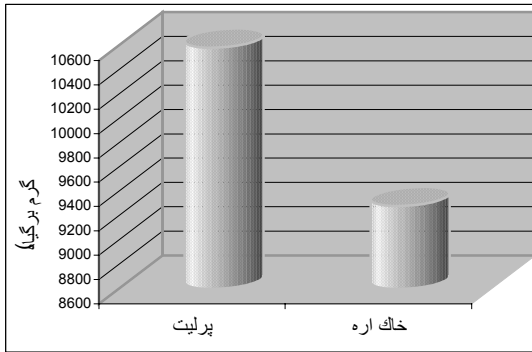
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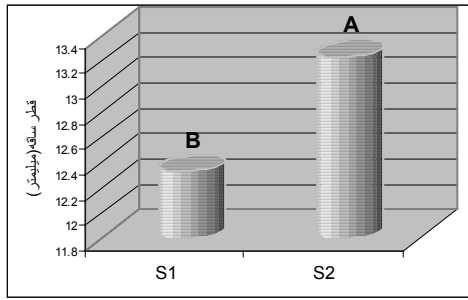
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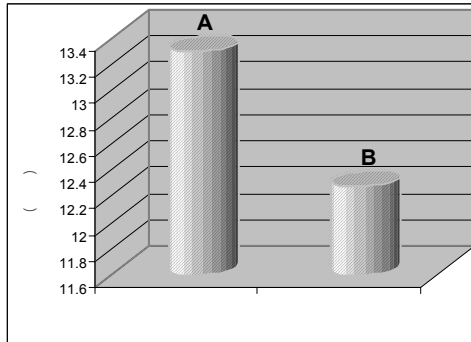
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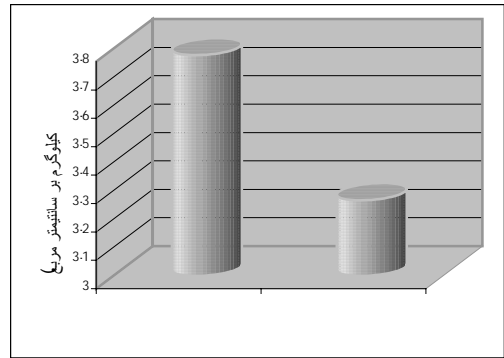
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(mmol/L)

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S1	,	A	,	A	,	A	,	B	,	A	,	A	,	A	,	A	,	A	,	A	,	A		
S2	,	A	,	A	,	A	,	A	,	A	,	A	,	A	,	A	,	A	,	B	,	A	,	A
S1*	,	A	,	A	,	A	,	A	,	A	,	A	,	A	,	A	,	A	,	B	,	A	,	A
S1*	,	B	,	C	,	A	,	B	,	B	,	AB	,	B	,	A	,	A	,	A	,	AB	,	A
S2*	,	A	,	B	,	A	,	A	,	AB	,	AB	,	B	,	A	,	A	,	B	,	A	,	A
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REFERENCES

3. Allaire, S., J.Caron, C.Menard, & M.Dorais.2004.Growing media varying in particle size and shape for greenhouse tomato. *Acta Hort.* 644:307-311.ISHS.
4. Atherton , J.Q. & J. Rudich. 1986. *The Tomato Crop*. Chapman and Hall Ltd. London. 661 pages.
5. Cantliffe, D.J., J.Funes, E. Jovicich, A.Parajpe, J.Rodriguez, & N. Shaw.2003. Media and containers for greenhouse soilless grown cucumbers, melons peppers and strawberries. *Acta Hort.* 614:199-203.
6. Costa J.M. & EP. Heuvelink .2004. *Protected Cultivation*. Flower tech. 2004. Vol. 7, no.2.
7. De Krijck, C. 1995. Latest insights into water and nutrient control in soilless cultivation. *Acta Hort.* 408: 47-61.
8. De Rijck G. & E. schrevens .1998. Comparison of the mineral composition of twelve standard nutrient solutions . *J. of Plant nutrition* , 21(10), 2115-2125.
9. Dorais M. & A.P. Papadopoulos.2001 Greenhouse tomato fruit quality. *Hort Rev.* Vol. 26, 239-319.
10. Gormley, T.R. & J.P.Egan.1978.Studies on the quality of tomato fruit grown in peat and nutrient solution media.*Acta Hort.*82:213-222.
11. Grillas, S., M. Lucas, E. Bardopoulou, S.Sarafopoulos, & M. Voulgari.2001. Perlite based culture systems: Cuurent commercial applications and prospects. *Acta Hort.*548:105-113.
12. Hui-lian Xu, L.Qauthier & A.Gosselin.1995. Effects of fertigation management on growth and photosynthesis of tomato plants grown in peat, rockwool and NFT. *Sci Hort.* 63 :11-20.
13. Hui-lian Xu, L.Qauthier & A.Gosselin. 1997. Greenhouse tomato photosynthetic acclimation to water deficit and response to salt accumulation in the substrate. *J. Japan. Soc. Hort. Sci.* 65(4):777-784.
14. Inden H. & A. Torres. 2004. Comparison of four substrates on the growth and quality of tomatoes. *Acta Hort.* 644 , 205-210.
15. Jensen, H.M. 1999. Hydroponics world wide. *Acta Hort* . 481 : 719-730.
16. Jiang, W.J., D.Y. Qu, D. Mu, & H.R. Wang . 2004. Protected cultivation of horticultural crops in china. *Hort. Rew.* 30: 115-162.
17. Jouet , J.P. 2001. Plastic in the world. *Plastic culture* 2(120): 106-127.
18. Kang J.Y., H.H. Lee & K.H.Kim.2004. Physical and chemical properties of inorganic horticultural substrates used in Korea. *Acta Hort.* 644 , 237-241.
19. Kang J.Y., H.H. Lee & K.H. Kim.2004. Physical and chemical properties of organic horticultural substrates used in Korea. *Proc. on growing media.* *Acta Hort.* 644 : 231-235.
20. Martinez, F.X., N.Sepo, & J. Valero. 1997. Physical and physiochemical properties of peat coir mixes and the effects of clay material addition. *Acta Hort.* 450: 39-46.
21. Mitchell,J.P., C.Shennan, S.R.Grattan, & D.M.May.1991. Tomato fruit yields and quality under water deficit and salinity. *J.Am.Soc.Hort.Sci.* 116:215-221.
22. Molla Md., Nuruddin, C.A. Madramootoo, & G.T.Dodds.2003. Effect of water stress at different growth stages on greenhouse tomato yield and quality. *Hortscience* 38(7): 1389-1393.
23. Morel P. & G. Gullemain .2004. Assessment of the possible phytotoxicity of a substrate using on easy biotest. *Proc. on growing media.* *Acta Hort.* 644 , 417-423.
24. Mzouri, M., J.Makhlouf, & A.Gosselin.1996. Influence of cultivar and substrate on quality and post-harvest storage of hydroponically greenhouse tomato. *Can. J. plant Sci.* 76:515-519.

25. Norrie J. M.E.D. Graham, & A.Gosselin.1994. Potential evapotranspiration as a mean of predicting irrigation timing in greenhouse tomatoes grown in peat bags. *J. AMER. Soc. Hort. Sci.* 119(2): 163-168.
26. Papadopoulos, A.P. 1994. *Growing Greenhouse Seedless Cucumbers In Soil And Soilless Media.* Agriculture and Agri-Food Canada Publication, 1902/E, Ontario, Canada. 126 pages.
27. Pardossi A., Franco Tognoni & Luca Incrocci.2004. Mediterranean greenhouse technology. *Chronica Hort.* Vol.44, No.2, 28-34.
28. Park H.J., Y.K. Jung, K.H. Kim, & J.E. Son.2004. Comparison of physical and chemical properties of growing media based on the European standard method and the self-compaction method. *Proc.on growing media. Acta Hort.* 644, 225-230.
29. Peet, M. M. & D. H. Willits. 1995. Role of excess water in tomato fruit cracking. *HortScience* 30:65-68.
30. Pulupol, L. U., M.H. Behboudian, & K.J. Fisher.1996. Growth, yield and post harvest attributes of glasshouse tomatoes produced under deficit irrigation. *HortScience* 31:926-929.
31. Raviv M., R.Wallah & T.J.Blom.2004. The effect of physical properties of soilless media on plant performance. *Acta Hort.* 644 , 251-258.
32. Shaw, N.L., D. Cantliffe, J. Funes, & C. Shine. 2004. Successful Beit Alpha cucumber production in the greenhouse using pine bark as an alternative soilless media. *HortTechnology* 14(2):289-294.
33. Shwarz. D. 2004. Roots-connecting the growing media with growing success. 2004. *Proc.of ISHS on growing media . Acta Hort.* 644, 327-336.
34. Traka-Mavrona E., D. Gerasopoulos, T. Peritsa, & E. Maloupa.2001. Growth, yield and quality of tomato in relation to substrate and nutrient source in a soilless culture system. *Acta Hort.* 548:173-179.
35. Urrestarazu, M., G. A. Martinez, & M.C. Salas.2005. Almond shell waste: possible local rockwool substitute in soilless crop culture. *Scientia Hort.* 103(4): 453-460.
36. Verdonck O. & P. Demeyer.2004. The influence of the particle sizes on the physical properties of growing media. *Acta Hort.* 644 , 99-101.
37. Voogt. W. & C. Sonneveld. 1997. Nutrient management in closed growing systems for greenhouse production. E. Goto et al. (eds), *Plant Production In Closed Ecosystems* , 83-102. 1997. Kluwer Academic publishers. Printed in the Netherland.