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(F3) *Glomus intraradices*(F2) *Glomus etunicatum* (F1) (F0)

(P2) (P1) (P0)

*Glomus versiforme*

/ (P0F0 )

:

( )

( )

( )

( )

Cmin

( )  
)

(

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( )

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( )

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*Glomus etunicatum*

(F0)

( )

H<sub>2</sub>PO<sub>4</sub><sup>-</sup>

HPO<sub>4</sub><sup>-2</sup>

(F1)Becker and Gerdemann

*Glomus intraradices* Schenck and Smith

pH

*Glomus versiforme* (F2)

(P0) ))

((F3) (Karsten) Berch

( )

((

(P2) (P1)

)

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2. The concentration at which influx equals efflux (Tinker 2000)

1. Mucigel

pH (1:2.5)	EC (1:5) (dS/m)	P ava. (mg/kg)	Nt (mg/kg)	Kava. (mg/kg)	O.M %	Sand %	Silt %	Clay %	Spore No./10g
/	/	/			/		/	/	

%

)

CECILE

(  
2041

%

MSTATC

( )

POF3

POF3

/ POF0

P2F1

( )

POF0

POF1 POF2

( )

( )

F2 F1 F0

P1

( ) ( )  
( )

( )  
( )

( )

F3

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( )

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/	n.s
/	n.s
/	n.s
/	**
/	*

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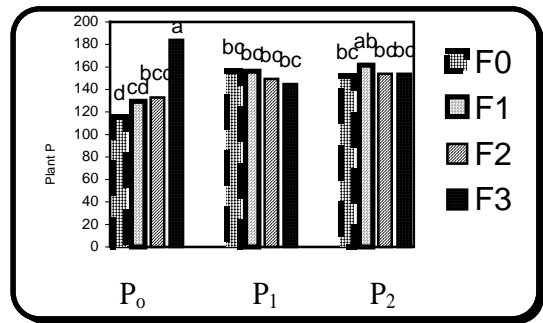
%CV= / : n.s \*\*

*Glomus*

( )

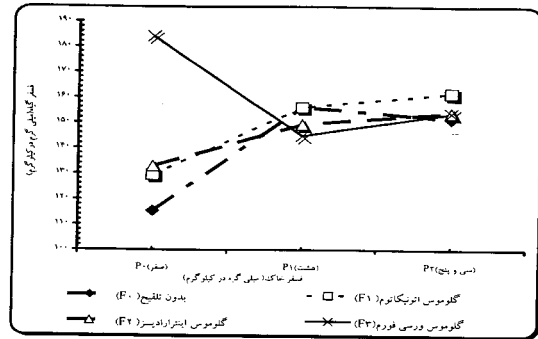
*clarum*

*Acaulospora mellea*



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شکل ۲. تغییرات مقدار فسفر در نهال‌های جای تنبیه شده و تلقیح نشده با قارچ میکوریزی به کاربرد سه سطح کرد فسفر

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( )

CO

( )

( )

P0

(P1)

( )

( )

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( )

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C/P=100

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## REFERENCES

1. Bolane,N.D., J. Elliot, P. E. H. Gregg & S.Weil.1997.Enhanced dissolution of phosphate rocks in the rhizosphere. *Biology and Fertility of Soils*. 24: 169-174.

2. Buwalda, J. G., D. D. Stribley, & P. B. Tinker. 1983. Increased uptake of bromide and chlorid by plants infected with Vesicular-Arbuscular mycorrhizas. *New phytol.* 93: 217-225.
3. Cohen, C. K., W. A. Norvell, & L. V. Kochian. 1997. Induction of the root cell plasma membrane ferric reductase: An exclusive role for Fe and Cu. *Plant Physiology.* 114: 1061-1069.
4. Cress, W. A., G.V. Johnson, & L.L. Barton. 1986. The role of endomycorrhizal fungi in iron uptake of *Hilaria jamesii*. *J. Plant Nutr.* 9: 547-556.
5. Fabig, B.F., K.A.M. Veilhauer & W. Achtnich. 1989. Gas chromatographic separation of organic acids and electrophoretic determination of phosphates from VA mycorrhizal roots. *Z. Pflanzemaehr Bodenk.* 152: 261- 265.
6. Gerke, J. 1992. Phosphate, Aluminium and Iron in the soil solution of three differet soil in relation to vary in concentrations of citric acid. *Zeitschrift fur pflanzen ernahrung und Boden kundel.* 155: 339-343.
7. Gupta, M.L., A. Prasad, M. Ram, & S. Kumar. 2002. Effect of the Vesicular- Arbuscular Mycorrhizal (VAM) fungus *Glomus Fasciculatum* on the essential oil yield related characters and nutrient acquisition in the crops of different cultivars of Menthol Mint (*mentha orvensis*) under field conditions. *Bioresource Technology*, 81: 71-79.
8. Hayman, D. S. 1983. The physiology of vesicular arbuscular endomycorrhizal symbiosis. *Can. J. Bot.*, 61: 944-963.
9. Hetrick, D. B. A., J. F. Leslic, G. Thompson wilson, & D. Gerschefske Kitt. 1988. Physical and topological assessment of effect of a vesicular-arbuscular mycorrhizal fungus on root architecture of big blue stem. *New Phytol.* 110: 85-96.
10. John, St. Se. 1996. Arbuscular mycorrhizal inoculation in nursery practice, In: Landis, T. D., South, D. B. , tech. Coords. National proceedings, Forest and conservation nursery associations. Gen. Tech. Rep. PNW- GTR- 389. Portland, Available at: [http:// www. Fcanet. Org./ Proceeding/ 1996/ stjohn.pdf](http://www.Fcanet.Org/Proceeding/1996/stjohn.pdf)
11. Karagiandis, N., F. Blestos, & N. Stavropoul. 2002. Effect of verticillium wilt (*Verticillium dahliaekleb.*) and mycorrhiza (*Glomus mosseae*) on root colonization, growth and nutrient uptake in tomato and eggplant seedling. *Science Horticulturae.* 94(1-2): 145-156.
12. Khan, A. G., & M. Belik. 1995. Occurrence and ecological significance of mycorrhizal symbiosis in aquatic plants. In: Varma, A. and Hock, B. (eds.), *Mycorrhiza*. Springer Verlag, Berlin. Pp. 627-666.
13. Knight, W. G., M. F. Allen, I. I. Jurinak, & I. M. Dndley. 1989. Elevated carbon dioxide and solution phosphorus in soil with Vesicular Arbuscular mycorrhizal western wheat grass. *Soil Sci. Soc. Am. J.* 53: 1075- 1082.
14. Marschner, H. 1995. Mineral nutrition of higher plant. 2nd edition, Academic Press, San Diego, London.
15. Matar, A. E., J. L. Paule, & H. Jenny. 1967. Two-phase experiments with plants growing in phosphate- treated soil. *Soil Science Society of America Proceedings.* 31: 235-237.
16. Mc Allister, C. B., J. M. Garcia-Garride, I. Garcia-Romera, A. Godeas, & I. A. Ocampo. 1997. Interaction between *Alternaria alternate* or *fusarium equiseti* and *glomus mossea* and its effect on plant growth. *Biology and Fertility of Soils*, 24: 301-305.
17. Menge, J. A., E. L. V. Johnson, & R. G. Plant. 1978. Mycorrhizal of several citrus cultivars under three nutrient regimes. *New Phytol.* , 81: 553- 559.
18. Otani, T. N. Ae. & H. Tanaka. 1996. Phosphorus (P) uptake mechanisms of crops grown in soils with low P status. II. Significance of organic acids in root exudates of pigeon pea. *Soil Science and Plant Nutrition.* 24: 553-560.
19. Powell, C. L. & D. J. Bagyaraj. 1986. VA mycorrhiza. CRC Press. Inc. Boca raton, Florida.
20. Rajan, S. K., B. J. D. Reddy, & D.J. Bagyaraj. 2000. Screening of arbuscular mycorrhizal fungi for their symbiotic efficiency with *Recton grandis*. *Forest Ecology and Management*, 126: 91-95.

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21. Rhodes, L. H. & J. W. Gerdmann. 1975. Phosphate uptake zones of mycorrhizal and non-mycorrhizal onions. *New Phytol.* 75: 555- 561.
  22. Romheld, V.1987. Existence of two different strategies for the acquisition of iron in higher plants. In: Winklmann, G., Van der Helm, D., Neilands, J. B.(Eds.), *Iron Transport in Microbes*. VCH publishers, Weinheim, FRG, pp. 353-374.
  23. Rowell, D. L.1996. *Soil science, methods and applications*. Longman, London.
  24. Sanders, F. E., & P. B. Tinker.1973. Phosphate flow into mycorrhiza roots. *Pesticide Science*, 4: 385-395.
  25. Schwab, S. M., J. A. Meng, & R. T. Leonard.1983. Quantitative and qualitative effects of phosphorus on extracts and exudates of sudan grass roots in relation to vesicular arbuscular mycorrhiza formation. *Plant Physiol.*, 73: 761- 765.
  26. Smith,S.E. & S. Dickson.1991.Quantification of active Vesicular-Arbuscular mycorrhizal infection using image analysis and other techniques. *Australian Journal of Plant Physiology*. 18:637-648.
  27. Smith, S. E. & D. J. Read.1997. *Mycorrhizal symbiosis*. Academic Press, San Diego, CA.
  28. Stribley, D. P., P. B. Tinker, & J. H. Rayner.1980. Relation of internal phosphorus concentration and plant weight in plants infected by Vesicular-Arbuscular mycorrhiza. *New Phytol*, 86: 261-266.
  29. Tinker, P. B. 2000. *Solute movement in the rhizospher*. Oxford University Press. Oxford.
  30. Trafdar, C. & H. Marschner. 1994. Phosphate activity in the rhizosphere and hyphosphere of VA mycorrhizal wheat supplied with inorganic and organic phosphorus. *Soil Biol. Biochem.* 26: 287-295.
  31. Vaast, Ph., R.J. Zasoki, & C. S. Bledose.1996. Effects of Vesicular-Arbuscular mycorrhizal inoculation at different soil availabilities on growth and nutrient uptake of in vitro propagated coffee (*Cofea arabica* L.) plants. *Mycorrhiza*, 6:493-497.
  32. Zhu, Y. G., P. Christis, & A. S. Laidlaw. 2001. Uptake of Zn by Arbuscular Mycorrhizal white clover from Zn-contaminated soil. *Chemosphere*, 42: 193-199.