

## THE EFFECT OF DIFFERENT LEVELS OF VAM FUNGI INOCULUM ON GROWTH OF TOMATO (*LYCOPERSICON ESCULENTUM* MILL.) IN SOILLESS CULTURE

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### Introduction

The importance of the VAM fungi in the improvement of plant growth under both glasshouse and field condition is well documented. VAM is found to enhanced nutrient uptake disease resistance in plants, and to increase the survival and re-growth of several container-grown horticultural plants. Since soilless culture substrates are commonly used in greenhouse transplant production, pre-inoculation with VAM fungi in the greenhouse prior to transplanting to the field would be less laborious and fit well into the current commercial production practices. At present, attempts have been made to use organic media, especially peat-based mixes and coconut mix which is locally available (Raja Harun and Muhammad, 1992), very few commercial VAM inoculants have been develop. The present study was conducted to determine the effect of different levels of VAM inoculum on yield of tomato grown in CD-Mix media.

### Materials and Methods

Two-week old tomato plants cultivar Cherry we transferred into cultivation slab (120 cm long x 30 cm wide white polythene bolster bag) consisted of 6 kg of CD-Mix media (coconut coir dust with specific proportions of peat-grow). The inoculum was placed as a thin layer, 5 cm below the roots, to ensure better infection. This experiment was conducted in the Hydroponic Glasshouse Unit at the Centre of Hydroponic and Protected Environment Agriculture, UPM, Selangor. The mean daily temperature was  $28.6 \pm 6^\circ\text{C}$  and the relative humidity (RH) was  $78 \pm 4\%$  RH. The experiment was conducted in a Completely Randomised Design with four replicates. The treatment consisted of four levels of inoculum (0, 10, 20, 30 and 40 g). The VAM inoculum (mixed culture of *Scutellospora calospora* and *Glomus mosseae*) was originally obtained from grass growing in tin tailing soils, UPM. Data were collected at week 7 after treatment for determination of the tomato yield. 10-g roots were randomly sampled for determination of mycorrhizal infection.

### Results and Discussion

Results showed that the yield and mycorrhizal infection on tomato plants as affected by different levels of inoculum. VAM inoculation at the lowest rate increased fruit dry weight by 21.43% relative to other inoculated plants. Since mycorrhizal plants grew better than non-mycorrhizal plant (0 g), the effect of different rate of VAM was tested further, using linear regression. There was a linear positive relationship between inoculum rate with number of fruit ( $y=234.09+1.215x$ ;  $r^2= 0.879$ ) and total soluble solid

( $y=5.603+0.038x$ ;  $r^2= 0.801$ ). Increased VAM inoculum rate increased linearly the number of fruit from 234.09 to 282.694 per plant and total soluble solids from 5.603 to 7.123%. There was highly significant ( $p<0.05$ ) effect of different rates of VAM inoculum on percentage root colonization. The increase in spore number was accompanied by a similar increase in percent root colonization. For 40 g inoculum, about 90% of number of spores on 10g root sampled, compared to 10 g of inoculum rate.

The number of fruit increased linearly with increasing inoculum VAM rate that is 21% higher than the control. Even yield per plant was not found statistically to be different (data not shown), but the results showed differences between the treatments, which previously were found to correlate well with, yield. It is possible that greater growth response may have occurred given a longer growth period, as evident from the significant increase in total soluble solids during the experiment time. In this study, a higher inoculum rate gave higher yield of 3.5 kg per plant in the 6-liter/cultivation slab of CD-Mix media. Results were similar to that previously reported (Raja Harun and Muhammad, 1992) who found that yield of a plant grown in 6 liter cocomix media was 3.19 kg per plant without mycorrhiza. Whether inoculated or not, plants were not significantly different in terms of yield, but the more important was inoculated tomato plants produced higher total soluble solids which is of importance in the market. Although in the colonization experiment, VAM formation was slow in the cultivation slab, it can however be improved by increasing the duration time. In the present investigation, spore counts and percentage of root colonization increased with increase inoculum rate, although the difference was not statistically significant for percent root colonization. It was suggested that the inoculum rate of VAM fungi have been effective in number of spores but not on root colonization because VAM fungi propagules found in the media may develop from dormant spores of the indigenous VAM. Reproduction of VAM appeared lower during the time and amount of root colonization may not change rapidly. However, root colonization is not a good indicator of VAM effectiveness as is the amount of external mycelium, which is the site of nutrient absorption (Graham et al. 1982).

### Conclusion

This study demonstrated that it is possible to introduce the mycorrhizal fungi into cultivation slab of CD-Mix media. The effectiveness of the mycorrhizal infection on growth of tomato plants was highest at 40 g inoculum per plant. The use of this particular CD-Mix under controlled environment and in the presence of VAM fungi propagules proved to be an effective way of introducing these fungi into commercial soilless culture system in the glasshouse.

### References

- Graham, J.H., Linderman, R.G. and Menge, J.A. 1982. Development of external hyphae by different isolates of mycorrhizal *Glomus spp* in relation to root colonization and growth of Troyer citrage. *New Pathologist*. 91: 183-189.
- Raja Harun, R.M. and Muhamad, A. 1992. The use of coconut potting mixture in the soilless cultivation of tomatoes. *Acta Horticulture*. 292: 155-160.