



## Effects of Fertilization on Tomato Growth and Soil Enzyme Activity

Zhen Mu, Xue-Feng Hu, Chang Cheng, and Zhi-qing Luo

Department of Environmental Science and Engineering, School of Environmental and Chemical Engineering, Shanghai University, Shanghai 200444, China (jenni\_mu@hotmail.com)

To study the effects of different fertilizer applications on soil enzyme activity, tomato plant growth and tomato yield and quality, a field experiment on tomato cultivation was carried out in the suburb of Shanghai. Three fertilizer treatments, chemical fertilizer (CF) (N, 260 g/kg; P, 25.71g/kg; K, 83.00g/kg), rapeseed cake manure (CM) (N, 37.4 g/kg; P, 9.0 g/kg; K, 8.46 g/kg), crop-leaf fermenting manure (FM) (N, 23.67 g/kg; P, 6.39 g/kg; K 44.32 g/kg), and a control without using any fertilizers (CK), were designed. The total amounts of fertilizer application to each plot for the CF, CM, FM and CK were 0.6 kg, 1.35 kg, 3.75 kg and 0 kg, respectively, 50% of which were applied as base fertilizer, and another 50% were applied after the first fruit picking as top dressing. Each experimental plot was 9 m<sup>2</sup> (1 m × 9 m) in area. Each treatment was replicated for three times. No any pesticides and herbicides were applied during the entire period of tomato growth to prevent their disturbance to soil microbial activities. Soil enzyme activities at each plot were constantly tested during the growing period; the tomato fruit quality was also constantly analyzed and the tomato yield was calculated after the final harvesting. The results were as follows: (1) Urease activity in the soils treated with the CF, CM and FM increased quickly after applying base fertilizer. That with the CF reached the highest level. Sucrase activity was inhibited by the CF and CM to some extent, which was 32.4% and 11.2% lower than that with the CK, respectively; while that with the FM was 15.7% higher than that with the CK. Likewise, catalase activity with the CF increased by 12.3% - 28.6%; that with the CM increased by 87.8% - 95.1%; that with the FM increased by 86.4% - 93.0%. Phosphatase activity with the CF increased rapidly and reached a maximum 44 days after base fertilizer application, and then declined quickly. In comparison, that with the CM and FM increased slowly and reached a maximum 66 days after base fertilizer application, but maintained the high level for a long time. In short, the application of organic manure, especially the fermenting manure, is more beneficial to maintain high levels of soil enzyme activities and biodiversity. (2) The tomato yield treated with the CF, CM, FM and CK was 50055 kg/ha, 37814 kg/ha, 36965 kg/ha and 29937 kg/ha, respectively. The yield increasing rates of the CF, CM and FM were 67.2%, 26.3% and 23.5%, respectively. The application of chemical fertilizer could raise the tomato yield more effectively. The use of organic manure, especially the fermenting manure, however, could improve the fruit quality more effectively, especially increase soluble sugar and vitamin C contents and reduce nitrate content in tomato fruit significantly. The application of biological fermenting manure is beneficial to promote the recycling agriculture in China. It could also be used in the organic farming promisingly.