

Effects of application of composted water-bamboo leaves on soil nutrients and vegetable quality

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Liantang Town of Qingpu District in the western suburbs of Shanghai is known as a land of water-bamboo, where the cultivation of water-bamboo attains more than 2000 ha in area. A huge amount of water-bamboo leaves, approximately 1.5×10^8 kg, are produced annually in the town and become a headachy agricultural waste. The leaves of water-bamboo are difficult to be biodegraded, and will adversely affect the growth of next crops if being directly returned to the fields due to its high C/N ratio. We transformed these water-bamboo leaves into organic manure through fermenting and composting. Total N, total P and total K of this fermented manure are 23.7 g kg^{-1} , 6.39 g kg^{-1} and 44.3 g kg^{-1} , respectively. To study the fertilizer efficiency of this organic manure, four field experiments on vegetables were carried out in the suburb of Shanghai. Each experiment designed the same four treatments of fertilization, including a lower amount of the fermented manure (LM), 3750 kg ha^{-1} ; a higher amount of the manure (HM), 7500 kg ha^{-1} ; synthetic chemical fertilizer (CF), 750 kg ha^{-1} ; non-fertilized CK. Each treatment has three replicate plots, and each plot was 9 m^2 in area. The results indicated that the application of the fermented manure increased the contents of organic matter and nutrients in the soils significantly. Compared with CK, the content of organic matter in the soils treated with HM increased by 16.0%, and those of alkali-hydrolyzable N, available P, available K, total N, total P and total K in the soils increased by 14.5%, 4.8%, 12.8%, 16.7%, 48.0% and 9.1%, respectively. Compared with CF and CK, the application of the fermented manure, both LM and HM, increased the numbers of bacteria, fungi and actinomycetes and improved the activities of urease and phosphatase in the soils significantly. The study also indicated that the contents of soluble sugar and Vitamin C in green peppers and tomatoes treated with HM increased by 62.8% and 14.8%, respectively, compared with CK; while those with CF only by 18.4% and 4.9%, respectively. Likewise, the contents of Vitamin C and soluble proteins in cabbage treated with HM increased by 115.3% and 31.4%, respectively. Compared with synthetic chemical fertilizers, the fermented manure released nutrients slowly and persistently, which was conducive to maintain soil fertility for a long term and reduce agricultural diffuse pollution effectively. Moreover, the application of this fermented manure increased the contents of soluble sugar and Vitamin C in vegetables and improved their quality significantly. Turning discarded water-bamboo leaves into organic manure through fermenting and composting is not only low in cost, but also contributes to the development of recycling agriculture in the suburbs of Shanghai.