

Abstract

This study aims to investigate (a) which of the soil variables (chemical, physical and biological properties) can be used as indicators reflecting differences in soil quality among organically, young organically, semi-chemically and conventionally managed rice fields, and (b) effects of the agricultural management practices of paddy field on soil variables. Dynamics of soil properties also were compared between before planting and after post-harvesting. Distribution of soil microorganism populations (bacteria, fungi, actinomycetes, and cellulolytic microbes) among agricultural management practices was statistically analyzed by Principal Component Analysis (PCA). The results clearly showed that mainly soil moisture content, bulk density, available phosphorus, soil pH, nitrogen content, organic matter, exchangeable Ca^{++} , Mg^{++} , Na^{+} , and K^{+} were considered to be soil quality indicators. In addition, organic and young organic fields are related to soil bacterial and cellulolytic microbes while semi-chemical, and chemical soils are related to soil fungi and actinomycetes, respectively. Microbial populations varied among agricultural management practices. The order of soil microorganism levels was found from highest to lowest as follows: organic field > young organic field > chemical field > semi-chemical field in both cases of before planting and after harvesting soils. In addition, the proportion of soil population varied among different soil sites. Organic and young organic areas contained the soil cellulolytic microbes greater than bacterial population, actinomycete population, fungal population, respectively. For semi-chemical and chemical areas, the proportion of soil microorganisms showed highest number of soil actinomycete followed bacteria, cellulolytic microbes, and soil fungi, respectively. DGGE profiles showed that the structure of microbial communities were different among soil sites. The patterns in PCR-DGGE profile were clustered into two groups: one group comprising the organic and young organic sites and second one from semi-chemical and chemical soils. These results suggest that the microbial diversity in the chemical fields is completely different from organic fields.

Keywords: Agricultural management practice, organic field, chemical field, soil microbial population, bacteria, fungi, actinomycetes, cellulolytic microbes, DGGE, PCA