

ABSTRACT

MICROBIOLOGICAL AND CHEMICAL SOIL ATTRIBUTES OF APPLE ORCHARDS UNDER CONVENTIONAL AND ORGANIC PRODUCTION SYSTEMS

The study was carried out in Urupema-SC, in apple orchards under conventional and organic production systems, with the following objectives: 1) to investigate the effects of production systems over nitrogen content, carbon content and activity of the microbial biomass, as well as the relationship between microbial biomass attributes and soil content of C and N; 2) to identify differences in terms of microbial biomass attributes between production systems by means of multivariate Canonical Discriminant Analysis; 3) to investigate the correlation between biological and chemical attributes in the soil from both production systems studied by means of Canonical Correlation Analysis and Pearson analysis. Soil samples were collected near 24 plants arranged in a grid in both orchards (conventional and organic) in December/2002 and June/2003, at the depth of 0-10 cm, and then analyzed for microbial biomass carbon (MBC), total organic carbon (TOC), microbial biomass nitrogen (MBN), total nitrogen (TN), MBC:TOC ratio, MBN:TN ratio, basal respiration (C-CO₂), and metabolic quotient (qCO₂). To assess the sensibility of biological attributes for changes on chemical attributes in the soil, the biological attributes of MBC, C-CO₂, qCO₂, and MBN were submitted to Canonical Correlation and Pearson Correlation analysis against the chemical attributes of TN, TOC, pH H₂O, N-NH₄, N-NO₃, and exchangeable contents of P, K, Na, Ca, Mg, and Al. The MBC and MBN were analyzed by the fumigation-extraction method. The MBC was assessed by titration and the MBN was assessed by pre-digestion and distillation according the Kjeldahl's method. The C-CO₂ was assessed in the laboratory. The organic orchard had higher values of MBC, TOC, and MBC:TOC ratio than the conventional orchard in both sampling dates. There was no effect of apple production system and of sampling date on C-CO₂. The conventional orchard had the highest values of qCO₂. The less sensitive attributes towards differences related to orchard management systems were MBN, TN, and MBN:TN ratio. In multivariate terms, the Canonical Discriminant Analysis highlighted the MBC as the most important microbiological attribute to discriminate between orchard management systems, followed by qCO₂ and MBN:TN ratio. The microbiological and chemical attributes related to the carbon were more sensitive towards differences between orchard management systems than the microbiological and chemical attributes related to the nitrogen. There was a highly significant canonical correlation between microbiological and chemical attributes of orchards soil samples, with a higher contribution of MBC for microbiological attributes, and of pH H₂O and Al for chemical attributes.

Indexation terms: soil quality, microbial biomass activity, microbial biomass carbon, microbial biomass nitrogen, and multivariate analysis.