TITLE: SHORT-TERM EFFECTS OF PESTICIDES UPON MICROBIAL COMMUNITIES FROM PRISTINE AND AGRICULTURAL SOILS

AUTHORS: ALVES, K.J.; SANTOS, G.D.; ANDREOTE, F.D.

INSTITUTION: UNIVERSITY OF SAO PAULO- "LUIZ DE QUEIROZ COLLEGE OF AGRICULTURE" – (ESALQ-USP) - DEPARTMENT OF SOIL SCIENCE, PIRACICABA, SP (PADUA DIAS AVENUE, 11, CEP: 13418-900, PIRACICABA-SP, BRAZIL)

ABSTRACT:

Pesticides used in agriculture to control pests and pathogens reach in high amounts the soil surface. However, little is known about the potential side effects of pesticides on soil microorganisms. In this context, this study aimed to test the short-term effects of seven of the most used pesticides (acephate, imidacloprid, carbendazim, mancozeb, glyphosate, 2,4-D, and cadusafos) on soil microbial biomass and on soil microbial activities, quantifying such effects in two soils, agricultural and pristine soils. The experiments were designed at microcosm level and all pesticides were added to soil microcosms as commercial formulation at the recommended doses. Microcosms were destructively sampled 3 and 7 days after the first application of pesticides, and 3 days after the second application. To test the soil microbial activity, the enzymes arylsulfatase, β-glucosidase and acid phosphatase were measured using the colorimetric determination of p-nitrophenol. The carbon contents on the soil microbial biomass were measure using the chloroform fumigation-extraction method. We observed variations in the characteristics evaluated according to pesticide, time and soil type. After 3 days of the first application, acephate increased the activity of the arylsulfatase, and mancozeb increased the activity of the β-glucosidase in the pristine soil. After 7 days of the first application, cadusafos and acephate reduced the arylsulfatase activity, while acephate reduced the acid phosphatase activity in the pristine soil. At 3 days after the second pesticide application, carbendazim and imidaclorprid increased the activity of the β-glucosidase in the agricultural and pristine soils, respectively. Soil microbial biomass was increased after 3 days of the first application of 2,4-D, acephate, cadusafos, carbendazim, and glyphosate in the agricultural soil. Furthermore, the acephate increased the soil microbial biomass in the pristine soil at 3 days after the first application and reduced at 3 days after the second application. The shifts in microbial biomass and enzymatic activity after the application of pesticides shows that, in short-term, the pesticides may stimulate the microbial communities capable of degrading pesticides. Molecular analyses will be performed to evaluate the effects of pesticides on the abundance of soil microorganisms, community structure and to infer on the genes related to pesticide degradation.

Keywords: Enzymatic activity; Microcosms; Microbial ecology

Development Agency: Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPQ) and Fundação de Amparo a Pesquisa do Estado de São Paulo FAPESP (19/03712-8)