Digging in the Dirt: Soil Warning on Pesticides

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Pesticides are essential for modern agriculture, especially in the tropical ecosystems where pest pressure is high. However potential adverse impacts of pesticide use on ecosystems and human health continue to be a cause of concern. Therefore the importance of reliable quantitative information on their fate and behaviour has increased considerably in recent years. A substantial body of literature on environmental fate and behaviour of pesticides is available. However it has predominantly originated from the temperate soils of Europe and North America. Indeed pesticide fate and behaviour in the terrestrial ecosystems of developing tropical countries remains poorly understood. Consequently, the regulatory agencies and resource managers in several developing countries, including Pakistan, have to rely on European and North American databases, without knowing their relevance to the local soil and environmental conditions. However such behaviour of pesticides may be different due to the inherently diverse chemical properties of the soils and their constituents thus presenting challenges in direct extrapolation of pesticide data from overseas. Focus of this study was on the chemistry of organic matter in soils from various countries and the assessment if overseas pesticide data is applicable to local soils. Fingerprinting of soil organic matter (SOM) in a wide range of soils from the United Kingdom, Australia, New Zealand, Pakistan, and Japan using ^{13}C NMR revealed substantial dissimilarities in the chemical composition of SOM. This evidence of variations in SOM composition was supported by micromorphological examination of selected soils contrasting in their binding propensities. Soils also varied greatly in their binding capacities for pesticides due to substantial variations in their characteristics. Variations in the quality of SOM precluded extrapolation of pesticide data between countries. This study demonstrates that the extrapolations and predictions based on overseas data are not reliable. Therefore extreme care needs to be exercised by the local pesticide registration authorities and regulatory “watchdogs” during assessment, evaluation and registration of pesticides based on data from overseas.